FEBRUARY 1941 Thirty-Five Cents Per Copy

Coal Age

Volume 46 Number 2

This Annual Review Number highlights progress along all operating fronts. Improved methods, greater coordination, better equipment helped produce the half billion total coal tonnage of 1940. With emergency demands still unrecorded at the year's close, 1941 should show gradually rising outputs as industrial activities inevitably increase. . . . **Lubrication** of mining equipment is a job of primary importance in every mine and particularly in highly mechanized ones. This operating and maintenance problem of lubrication methods and performance has been completely analyzed at Kings mine of Princeton Mining Co. and the gist of it all will soon be told by Master Mechanic Guiney and Ivan Given in Coal Age. . . . **Modernization** both below and above ground made continued gains in 1940. Conveyors, loaders and cleaning-plant installations are pegged by governmental survey, p. 59; with comment on the 1940 added impetus in bituminous mechanization given, p. 51; preparation, p. 81; and rubber-tired haulage, p. 67. Power supply and maintenance advances last year are sketched, p. 77, to complete that general picture, while stripping activities in 1940 are outlined, p. 54. . . . **Coal Sales Programs** were

(CONTINUED ON PAGE 7)

Contents

Coal Advances on Competition While Planning Stabilization..... 43

Survey Shows Three to One Vote for Extending Guffey Law..... 49

Bituminous Mechanization Gains Added Impetus in 1940..... 51

Strippers Install Shovels, Draglines and Large Haulage Units..... 54

Anthracite Control Program Improves Its Financial Status..... 57
By LOUIS C. MADEIRA, III

Loader Sales and Cleaning Capacity Up, Conveyors at New High.. 59
By H. W. YOUNG, R. L. ANDERSON, G. A. LAMB and F. M. SHORE

Improved Practices Recorded by Bituminous Mines Last Year..... 62

Rubber-Tired Haulage Installations Gain in Thin-Coal Mines..... 67

Safety Record Hard Hit in Soft Coal; Hard-Coal Rate Down..... 69
By R. B. SAYERS

Anthracite Progresses in Mining and Preparation in 1940..... 71

Renaissance in Coal Augured by Rising Interest in Research..... 75
By CLYDE E. WILLIAMS

Power Supply and Maintenance Practices Continue to Improve.... 77

Bituminous Preparation Facilities Show Further Gains in 1940..... 81

Coal Research Can Supply Many and Varied Industrial Needs.... 86

Editorials ..... 41 Mining Man's Forum.... 94 Questions and Answers. 96
Operating Ideas ..... 98 News From the Field... 109

TESTED A McGRAW-HILL PUBLICATION READERSHIP

COAL AGE (with which is consolidated "The Colliery Engineer" and "Mines and Minerals") is published monthly on the 1st. Allow at least ten days for change of address. All communications about subscriptions should be addressed to the Director of Circulation, 330 West 42d Street, New York, N. Y.

Subscription rates: United States, Canada, Mexico, Central and South America, $3 for one year, $4 for two years, $5 for three years. Great Britain and British Possessions, 30 shillings for one year, 60 shillings for three years. All other countries, $5 for one year, $10 for three years. Single copies, 35 cents each. Entered as second-class matter Oct. 14, 1936, at the Post Office at Albany, N. Y., under the Act of March 3, 1879. Printed in the U. S. A. Cable address: "McGraw-Hill, N. Y." Member A.B.P Member A.B.C.

SYDNEY A. HALE, Editor
WALTER M. DAKE, Managing Editor
R. DAWSON HALL IVAN A. GIVEN J. H. EDWARDS
LOUIS C. McCARTHY CHARLES H. LAMBUR, JR. PAUL WOOTON
H. W. CLARKE, Vice-President

Contents Copyright 1941 by
McGRAW-HILL PUBLISHING COMPANY, INC.
JAMES H. McGRAW, Founder and Honorary Chairman
Publication Office, 99-129 North Broadway, Albany, N. Y.
Editorial and Executive Offices, 330 West 42d St., New York, N. Y.
JAMES H. McGRAW, JR., President — HOWARD EHRLICH, Executive Vice-President — MASON BRITTON, Vice-Chairman
B. R. PUTNAM, Treasurer — D. C. McGRAW, Secretary — J. E. BLACKBURN, JR., Director of Circulation
Branch Offices, 520 North Michigan Ave., Chicago; 68 Post St., San Francisco; Aldwych House, Aldwych, London, WC 2; Washington; Philadelphia; Cleveland; Detroit; St. Louis; Boston; Atlanta, Ga.

SHOVEL—SHOVEL—TONNAGE DOUBLE

(Above) **IN 18 CONSECUTIVE 7-HR. SHIFTS,** one machine loaded 11,628 tons into 4,081 cars. From face to tipple, high-speed uninterrupted movement of material is assured with TEXACO.

(Below) **KNIFE RIVER COAL MINING** operations at Beulah, N. Dak. For 10 years, mine cars, cutters, loaders, locomotives and tipple have been lubricated with TEXACO.

11,628 TONS IN 18 CONSECUTIVE 7-HOUR SHIFTS

AVERAGING 646 tons per 7-hr. shift for 18 consecutive days, a coal loader in this western mine has given a fine example of the smooth high-speed performance of modern equipment, properly lubricated.

Coal mines in all U. S. fields are boosting output to new highs . . . cutting costs to new lows . . . with machinery kept at peak with *Texaco Lubricants.*

Using Texaco, you get the advantages of lubricants engineered specifically for mine use . . . higher machine efficiency . . . freedom from undue wear . . . low maintenance and lubrication costs. You get the convenience of a single source of supply . . . the assurance of undivided responsibility.

The outstanding performance that has made Texaco preferred in this field has also made it preferred in the fields listed in the panel.

These buyers are enjoying many benefits. You, too, will find important advantages when you use Texaco Lubricants and Fuels.

A Texaco Lubrication Engineer will gladly cooperate in making savings in *your* mines. Phone the nearest of more than 2300 Texaco distributing plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York, N. Y.

THEY PREFER TEXACO

- ★ **More tourists use Texaco *Fire-Chief* Gasoline than any other brand.**
- ★ **More scheduled airline mileage within the U.S. and to other countries is flown with Texaco than with any other brand.**
- ★ **More buses, more bus lines and more bus-miles are lubricated with Texaco than with any other brand.**
- ★ **More stationary Diesel horsepower in the U.S. is lubricated with Texaco than with any other brand.**
- ★ **More Diesel horsepower on streamlined trains in the U.S. is lubricated with Texaco than with all other brands combined.**
- ★ **More railroad rolling equipment in the U. S. is lubricated with Texaco than with any other brand.**

TEXACO DEALERS INVITE YOU TO ENJOY

FRED ALLEN in a full-hour program every Wednesday night. CBS, 9:00 E.S.T., 8:00 C.S.T., 10:00 M.S.T., 9:00 P.S.T.

METROPOLITAN OPERA every Saturday afternoon, NBC. See local newspaper for time and station.

TEXACO REG. T.M.

TEXACO Lubricants

FOR THE MINING INDUSTRY

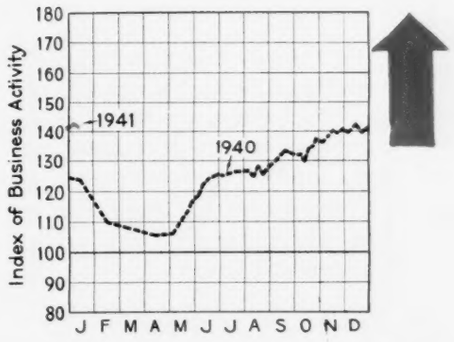
(CONTINUED FROM PAGE 5)

nationally advocated for concerted effort late in 1940, though many individual companies have long been outstanding in advertising effectiveness. But sales promotion by a small truck mine is unusual. Read it soon in Coal Age. . . . **Anthracite** deep and strip mining as well as preparation practices were further improved in 1940. A summary of these developments is found, p. 54. Stabilization and control program effect on the financial stability of the industry is reviewed by Louis C. Madeira, III, p. 57. . . . **Research** claimed rising industry-wide interest last year as plans for the immediate future attest. Clyde E. Williams points out that coal's "renaissance" is now foreshadowed by present research activities, p. 75. . . . **The Guffey Act** expires April 26, 1941, if no legislative action is taken to extend it. Controversial as its beneficial or detrimental features may be, its initial result is important. To cross-section this result Coal Age shot questions to operators in all producing fields, and answers from those replying are tabulated by districts, p. 49. Though prices were actually in effect only three months of 1940, in which year a 15-per-cent increase in output occurred, indications are that greater realizations are predominant. The act's pros and cons are still individual company affairs, though continuance for two additional years is advocated by a large majority of the returns. This Coal Age survey is timely and interesting.

HOW'S BUSINESS

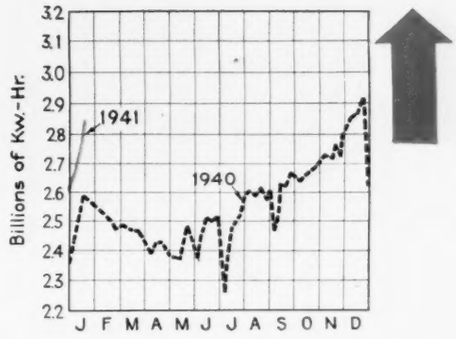
GENERAL BUSINESS CONDITIONS

Industrial orientation of the country, according to *Business Week* of Jan. 18, now centers in Washington with the introduction in Congress of the all-out lend-aid-to-Britain bill. More and more it will become the task of government officials rather than the open market to maintain economic and financial equilibrium. The *Business Week* Index set another new high of 143.2 in the week ended Jan. 11, receding to 142.5 the following week. On Dec. 21 it was 142.3; Dec. 28, 141.1; Jan. 4, 142.1.



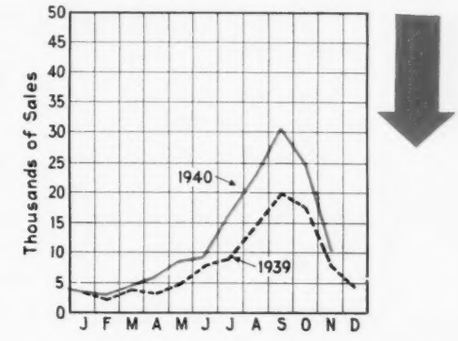
ELECTRICAL POWER OUTPUT

Output of electric energy by the electric light and power industry, according to the Edison Electric Institute, set new records in the weeks ending Dec. 14 and 21 with 2,862,000,000 and 2,910,914,000 kw.-hr. respectively. For the week ending Dec. 28 output was 2,623,000,000 kw.-hr.; Jan. 4, 2,705,000,000; Jan. 11, 2,834,512,000 kw.-hr. Rise in production fairly closely parallels that of last year, that for the latest week being 9.3 per cent above the corresponding week a year ago.



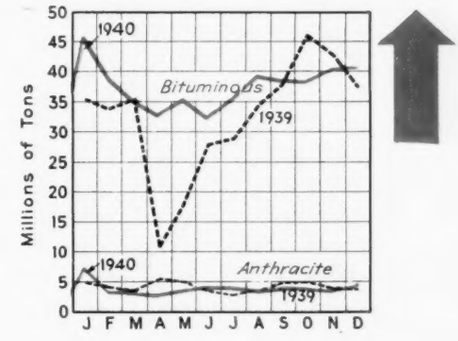
COAL STOKER SALES

Mechanical stoker sales in the United States in November last totaled 10,840 units (U. S. Bureau of the Census from 107 manufacturers), compared with 25,503 in the preceding month and 8,491 in November, 1939. Sales of small units in November last were: Class 1 (under 61 lb. of coal per hour), 9,239 (bituminous, 8,280; anthracite, 959); Class 2 (61-100 lb. per hour), 819 (bituminous, 788; anthracite, 31); Class 3 (100-300 lb. per hour), 533.



COAL PRODUCTION

Bituminous coal produced by United States mines in December last (preliminary) totaled 40,600,000 net tons, according to the Bituminous Coal Division, U. S. Department of the interior, which compares with 40,012,000 tons (preliminary) in the preceding month and 38,066,000 tons in December, 1939. Anthracite tonnage in December last (preliminary) was 4,671,000, according to the U. S. Bureau of Mines, against 3,869,000 in the preceding month and 3,914,000 in December, 1939.



ADVERTISING PAGES REMOVED

STOP-start, STOP-start, STOP-start . . .

—and 5 savings go with the wind!

Let's take a trip to a tipple where S-D "Automatics" have not yet been installed. The mine car trip comes to the tipple, stops, men go into action, costly dumping equipment slams one or more cars over and the coal crashes into the bin. With empties back in position, loaded cars move up, stop, and the process is repeated again and again until finally the entire trip is unloaded. Yes, it does the job, but it's expensive and so slow when compared with the S-D "Automatic" way.

The NEW S-D "AUTOMATIC"

Now, let's take a ringside seat at the tipple of an S-D "Automatic"-equipped mine. Here come the "Automatics" rolling to pay dirt! You won't see them long, so keep your eyes riveted as S-D savings are being made. First; no expensive dumping equipment, and second; no labor . . . they aren't needed. Third; the trip passes over the tipple at a 20-car-per-minute-clip, no stopping whatsoever, each car automatically discharging its load after it contacts, in its stride, a simple door tripping device. Fourth; there is a minimum of coal breakage. Coal does not crash into the bin. It is laid down gently through one door at a time . . . one door leveling the coal laid down by the preceding door. Fifth; there's a big saving in maintenance. "Automatic" cars lead an easy existence. They are not subjected to the strains incident to being lifted and turned over for dumping.

You've just seen in this mental picture 5 savings being made . . . savings of dumping equipment cost—savings on tipple labor —savings in elimination of tipple delays—savings in reduced coal breakage and great savings in maintenance. This is the true picture of what is going on in a rapidly increasing number of mines all over the country. Don't let these savings slip by you! Investigate "Automatic" savings NOW.

YOU CAN RENT "AUTOMATICS"

Let us show you how you can make money by installing S-D "Automatics" on a rental basis . . . how your savings will more than pay the rentals. Write for copy of rental plan. **Sanford-Day Iron Works, 121 Dale Ave., Knoxville, Tenn.**

SANFORD-DAY

MINE CARS, ALL TYPES
TRAILERS · WHEELS · SHEAVES

DEVOTED TO THE OPERATING, TECHNICAL AND BUSINESS PROBLEMS OF THE COAL-MINING INDUSTRY

Coal Age

Established 1911—McGraw-Hill Publishing Co., Inc.
SYDNEY A. HALE, Editor • FEBRUARY 1941

Pertinent and Impertinent

• THERE'S ONLY one drawback to the easy money of boom-time profits. Easy money usually is hard to get and still harder to keep.

• IF IT TAKES $400 per kilowatt to build a hydro-electric plant and only $90 for a steam plant, which can better be justified on cold economics? Perhaps T.V.A. would like to answer that one.

• NO ONE KNOWS what degree of moisture will wet a mine roof and make it swell materially. It probably does not require air saturation; perhaps not even an approach to it. But the optimum partial saturation of air for every mine should be known, even if that saturation or dissaturation cannot be provided.

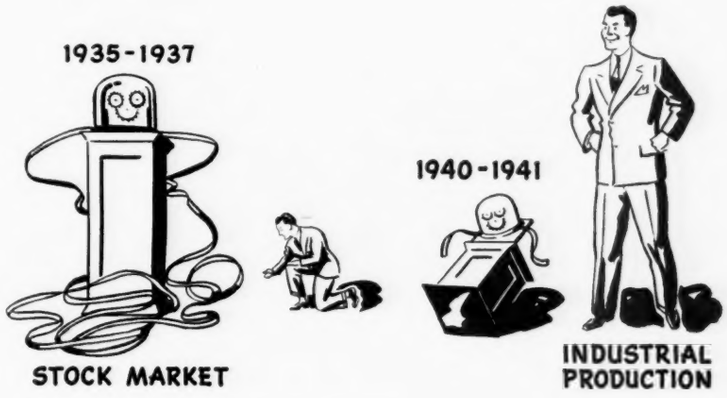
• INCREASED PRICES on domestic fuel oil are not welcomed by the Consumers' Division of the National Defense Advisory Commission, which flatly asserts "there is no justification for a further rise." Advances in lumber prices have been denounced by Leon Henderson, key man on price control at Washington; threats of drastic action if prices do not fall are made. Price movements in raw materials generally are being closely watched. Price control by statute is not without its advantages in these critical times.

• MANAGEMENT AND LABOR are both on record in favor of a guns-and-butter economy during our rearmament program. "To create defense weapons at the expense of our standard of living," says Philip D. Reed, chairman of the board, General Electric Co., "would be as inexcusable as it would be unintelligent except as a last and inescapable resort." And C.I.O. President Phil Murray also wants to see the normal economy continued with the defense program superimposed. But only unstinting cooperation by both groups can preserve this desirable economy. With such cooperation, preservation is not only possible but feasible—barring always foreign developments which may make the all-out signal for national defense imperative.

• DO stock-market quotations give you the jitters? Cheer up! According to the Cleveland Trust Co., "stock prices have lost their former attribute of acting as trustworthy indicators and forecasters of changes in business activity." If the relationship between stock prices and industrial production existing as recently as 1935, 1936 and early 1937 still prevailed, Standard Statistics' index of prices of 420 stocks "would now be 100 points higher than it actually is." For the present, it would seem that the Wall Street tail no longer wags the industrial dog—not with billions being poured out for national defense.

• BITUMINOUS COAL will fuel the multi-million-dollar high-explosives plant now under construction at Wilmington, Ill. But oil gets the call in specifications for several other munitions plants to be located near coal-mining areas. Why? Because the Quartermaster General accords oil a higher factor of safety. This should be news to a lot of people who should know—including management of existing explosives plants where consumption of solid fuels in 1937 exceeded their coal equivalent of fuel oil by 75 per cent.

• CAN the small mine match the bigger operation in efficiency? Progressive management is answering that question affirmatively every day. And manufacturers with vision are helping by building small-



er underground machines and cleaning-plant units which yield nothing to their larger counterparts. Mere size is no automatic index to efficiency in coal mining.

By-Lines

ADEQUACY of treatment and coverage in an annual review of progress in the industry would be impossible without the cooperation of the industry itself. This issue of *Coal Age* is a summary of the contributions of hundreds of coal-mining executives, government officials, educators, research workers and manufacturers. Sources of some of these contributions are acknowledged by "by-lines" showing the names of the authors of particular articles. But in the vast majority of cases no such specific recognition is—and in some cases can—be given except in the names of individual companies whose progress is reported. To these here unnamed, but not anonymous, contributors, appreciation and thanks for their help in rounding out the picture of coal's achievements in 1940.

Opportunity Beckons

NEXT MONTH members of the Appalachian joint wage conference meet in New York City to negotiate a new agreement between operators and miners. Convening on March 11, less than three weeks have been allotted to formulating a contract to take the place of the one expiring March 31. This is far, far from an impossible task if the conferees approach their job resolved to face the realities of the situation and to junk the maneuvers which have made too many conferences of the past tragi-comedies.

Today the country is in no mood for a theatrical display—however good the show may be. It is in no mood to have the supply of its basic fuel for the national-defense program even threatened by the faint shadow of a suspension. Should that shadow darken, it is not likely that the general public will be discriminating in its assessment of responsibility. The coal industry is rarely a divisible unit in the public mind. Blanket condemnation furthers the cause of neither coal-mine management nor coal-mine labor.

In a period when industrial relations are under a critical spotlight, the coal industry is in a position to demonstrate industrial statesmanship. It can dispose of the usual trading demands and get down to fundamentals without fuss and without protraction. Or it can insist on following the usual wearisome routine of past wage negotiations. Which course will it pursue?

Forced Ventilation

YEARS BACK, even in thick coal, a haulage heading and its satellite airway constituted the normal entry. In thin coal, and sometimes also in thick, this is still recognized practice. But with greater lengths of air travel, with larger mines demanding more air and with bigger equipment units, especially cars, that block the headings to the passage of air, more headings have had to be driven to provide adequate ventilation. Today, however, the trend to mining on the advance and the need to open up a number of headings close together and advancing concurrently are making operating men desire many more headings than ventilation alone might justify. All of which improves ventilation and gives protection should heavy falls occur.

Why Not a Coal Man?

COAL MEN both fathered and cradled the American Institute of Mining and Metallurgical Engineers. That great organization had its genesis in the anthracite region in the early '70s. Nominating committees in recent years, however, seem to have been singularly indifferent to the presidential timber existing among the coal members of the institute. Only four times in the last quarter of a century has their choice for president been a man whose major identification was with coal mining. Howard N. Eavenson, whose term expired in February, 1935, was the last to so serve. Coal was passed by this year. What about 1942?

A Lively Corpse

SENATOR NEELY has forsaken Washington's legislative halls for Charleston's executive mansion, but federal mine inspection is still a live issue. Although the old Neely-Keller bill died with the Seventy-sixth Congress, both the original measure and an amended draft have been introduced in the session which opened last month. Representative Smith of West Virginia, chairman of the House Committee on Mines and Mining, is sponsor for the reintroduced bill; the revised draft is fathered by Representative Flannery of Pennsylvania.

Unprejudiced observers and also not a few of the stoutest opponents of the proposal believe that, if either bill is brought out of committee, its chances for passage are considerably better than even. The series of major coal-mine disasters of 1940 set the stage for such action. When the public oratory is unleashed, the bitter fact that the measure will not live up to the specious promises of its proponents will carry little weight. Another law will burden the statute books, but the cause of safety in mining will not be measurably advanced.

The obligations of the coal industry, however, go beyond blocking enactment of a bill advertised to confer benefits it cannot deliver. Since mine inspection is properly a State function, a more vigorous and continuous campaign must be waged to strengthen the State inspection systems. There are State departments inadequately financed and inadequately staffed for the work they should do. There are still too many States where department heads are the political pawns of changing administrations. Civil-service status and protection for inspectors should be general.

Seeing that these and other necessary improvements are effected is the job of every forward-looking coal-mine executive and operators' association. It is a job which should be pressed regardless of the fate of the bills now before Congress. Tackling it with all the force and resourcefulness the industry has should not be delayed.

COAL STAGES ADVANCE

In War With Competition While Perfecting Plans for Stabilization

WITH business frisking ahead under the influence of the defense hypodermic, bituminous coal benefited to the tune of a 15-per-cent production increase in 1940. Producers and cooperating interests, including labor, vigorously continued their battle against the encroachments of substitute fuels and found much encouragement in such gains as a rise of 45 per cent in sales of small household and commercial stokers. Plans were completed for a three-year continuance of the industry's research program through the medium of Bituminous Coal Research, Inc.

Promulgation at long last of minimum prices under the Guffey-Vinson Act was another 1940 development. These prices and their accompanying marketing rules and regulations went into effect Oct. 1 and precipitated a shower of requests for relief, most of which were granted temporarily pending investigations and hearings. Federal regulation under the act, expiring April 26, 1941, weathered a constitutional test in 1940 when the Supreme Court ruled against the Sunshine Anthracite Coal Co.

Total bituminous output in 1940, according to preliminary estimates by the Bituminous Coal Division of the Interior Department, was 452,445,000 net tons, an increase of 59,380,000 tons, or 15.1 per cent, over the 1939 total of 393,065,000 tons. In recent years, however, preliminary estimates have been around 1 per cent less than the totals shown by the final canvasses. If this holds for 1940, the final figure should be greater by some 4,000,000 tons or more. "The seasonal trend, coupled with further expansion of industrial activity all along the line," will bring still further increases in 1941, declared John D. Battle, executive secretary, National Coal Association, in forecasting a first-quarter output of 125,000,000 tons, compared with 119,000,000 in the first three months of 1940.

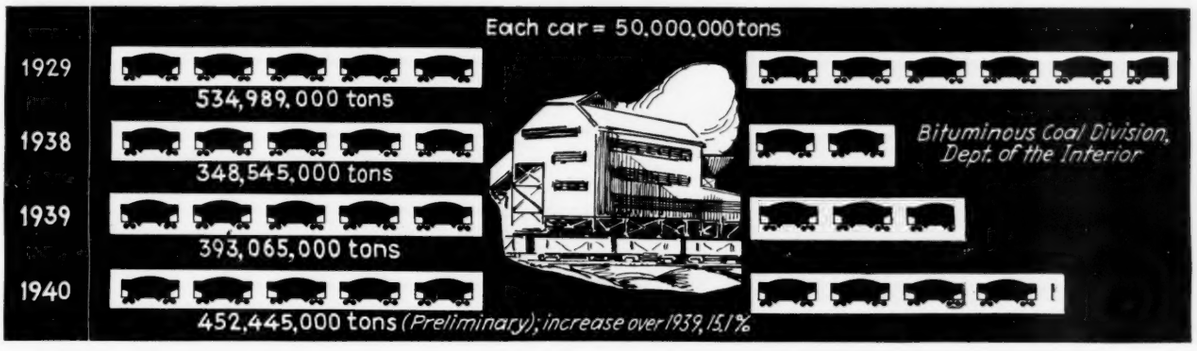
One factor in the 1940 production rise was an increase of about 10,000,000 tons in stocks in the hands of industrial consumers and retailers. Railroad coal consumption was up some 4,844,000 tons, or 6.4 per cent. Electric public utilities used 6,944,000 tons (15.6 per cent) more coal. Both the railroad and utility figures include some anthracite. A major increase in pig-iron output upped coal consumption for this purpose 15,400,000 tons, or 34.8 per cent.

Consumption by steel and rolling mills, coal-gas retorts, cement mills, coke ovens (coal for coke for purposes other than pig-iron production) and "other industrials," on the basis of available data, rose about 21,900,000 tons, or 17.2 per cent. Exports of bituminous coal also were up one-third or more and probably ran more than 3,500,000 long tons ahead of 1939.

A record for lake shipments was hung up in 1940, with cargo and fuel loadings at the lower lake ports totaling 48,111,191 tons, an increase of 6,987,583 tons, or 17 per cent, over the 1939 figure of 41,123,608 tons. The previous peak movement of 45,440,696 tons took place in 1936.

Anthracite ended the year with a slight tonnage loss on the basis of preliminary estimates by the U. S. Bureau of Mines. Institution of a pro-

Fig. 1—Defense work helps raise bituminous output in 1940.



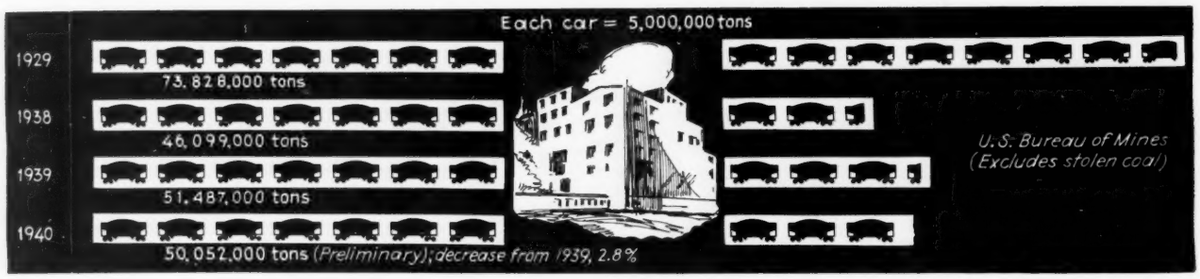


Fig. 2—Anthracite output drops slightly in 1940.

duction-control plan, however, resulted in a high degree of price stability, with consequent improvement in realization due to elimination of much of the cutting which had featured business in late years, notably 1939.

Hard-coal output is estimated at 50,052,000 net tons for 1940, a drop of 1,435,000 tons, or 2.8 per cent, from the 1939 figure of 51,487,000 tons. Stolen, or "bootleg," production is estimated at 4,000,000 tons or more in 1940, in which year bootleggers found the production-control set-up a material help.

Anthracite Controlled

Production control, based on estimating production requirements by weeks and then setting a tonnage quota divided on a percentage basis among producers signatory to the plan, was approved by Governor James Jan. 23 and went into effect Jan. 29. Voluntary in nature, the plan relies on the good faith of the producers, plus the influence of the Commonwealth and the United Mine Workers, for enforcement. In fact, participation of the United Mine Workers was one of the mainstays of the plan. The 1940 results were considered satisfactory, although there were some complaints of inroads by non-participants and bootleggers, as well as charges that certain adherents were indulging in violations. Hints that the federal anti-trust laws might be invoked against the plan were in part responsible for a proposal for a House investigation of the industry, offered in August by Representative Flannery, Pittston, Pa. It was adopted Sept. 19.

Participants in the control plan include the seven "old-line" companies and the majority of the independents, their producing capacity aggregating nearly 99 per cent of the total. In the 48 weeks the plan was in operation in 1940, the production quota was set at 480,000 tons for two weeks (two working days per week), 720,000 tons for 28 weeks, 840,000 tons for 1 week, 960,000 tons for 12 weeks and 1,200,000 tons for one week. The quotas cover "commercial coal" only, and exclude colliery fuel, sizes smaller than buckwheat No. 3, certain production from culm banks and some other exempted classifications. Total for the 48 weeks was 36,400,000 tons. In contrast, total output for the same period, derived from adding the weekly estimates of the U. S. Bureau of Mines, was 44,602,000 tons. Except in the summer months, when the excess was as high as 400,000 tons, the difference between quotas and Bureau estimates usually ranged from 100,000 to 200,000 tons. In two instances, total weekly output was less than the quota.

Compliance Considered

With quotas and allocation in effect, independent producers affiliated with the Anthracite Operators' Association turned their attention to means of facilitating compliance. Leading suggestions were a clearing house for the exchange of sizes between producers to balance long and short positions, and storage on the warehousing plan whereby storers would be able to borrow against the tonnage in stock. Reports indicate that both schemes were tried to some extent.

In October, Michael J. Kosik, president, District 1, United Mine Workers, declared that certain violators would feel the wrath of the union, while W. W. Inglis, president, Glen Alden Coal Co., was quoted as stating that his company had a club "which it can use to good effect, and that it will be greased up for use pretty quickly unless there is a sudden and unexpected turn for the better in the operation of the allocation program." Reports indicated an improvement in the remaining months of the year, while in January, 1941, a price-fixing bill prepared by the producers was being readied for the Pennsylvania Assembly.

Eliminating the bootlegger was another problem occupying the attention of the industry in 1940. Suggestions ranged from hiring of bootleg miners by legitimate producers and closing of their operations to the employment of these men in reforestation and road work, in addition to a plan calling for an increase in the allocation of producers taking on men from the outlaw industry. Several meetings with Commonwealth officials punctuated the proceedings, but no definite action had been taken on any of the proposals at the end of the year. Most of what improvement there was in the bootlegging situation was due to legislative or law-enforcement barriers set up by States bordering on Pennsylvania, although early in 1940 New Jersey's "Certificate of Origin Law" was declared unconstitutional by a Federal District Court. An appeal to the Supreme Court is planned.

Imports Lower in 1940

Anthracite gained in the form of a reduction in imports of solid fuels in 1940, which gain is expected to increase in 1941. At the same time, exports to Canada increased. Imported fuel oil, however, continued to be a sore point with the industry, which had previously protested against concessions in certain reciprocal trade agreements, notably with Venezuela, which runs to Dec. 15, 1942.

No major changes took place in anthracite freight rates in 1940, although the so-called "Motor-Compelled Rates" were extended until June 21, 1942. Certain producers joined with the Pennsylvania Attorney General in a request to originating railroads that rates on steam sizes be reduced in the "Motor-Compelled" territory, and that reductions on both domestic and steam sizes be extended to eastern and central New York. Refusal by the carriers was followed by preparation of a petition to be presented to the Interstate Commerce Commission. Late in the year, anthracite joined bituminous operators, coal-traffic bureaus and a number of oil producers and refiners in opposition to reductions in freight tariffs, specifical-

ly on crude petroleum, fuel oil and other oil products, from the Middle West to eastern destinations. These later were withdrawn.

Proposals for piping oil and natural gas into anthracite territory continued to plague the industry in 1940, although it was successful in opposing the introduction of natural gas into certain areas by southeastern Pennsylvania natural-gas interests. Along with soft coal and coke, the railroads and labor, anthracite opposed vigorously a proposal for constructing a natural-gas line from Texas to Philadelphia, New Jersey and Metropolitan New York. Hydro projects, notably the St. Lawrence Seaway and projects in the Delaware and Connecticut River valleys, also met with hard-coal opposition.

Anthracite continued to benefit from research in 1940, notably in increased sales of "Anthrafilt." Water-gas generation with anthracite was the subject of tests under an industry-commonwealth cooperative program continuing to May 31, 1941, when Commonwealth appropriations run out. A second project was the use of anthracite in the production of commercial carbon. Extension and enlargement of the program are expected to be considered by the next Pennsylvania Assembly.

The event of the year in the bituminous industry was the fixing of minimum prices, most of which became effective Oct. 1, with certain supplementary lists on Oct. 7. The hearings which followed cancellation of the original lists on Feb. 26, 1938, came to an end Jan. 20, 1940, after 140 days and 25,692 pages of testimony. Oral arguments on exceptions were completed Feb. 16 and the Bituminous Coal Division began reconstituting itself as a compliance rather than fact-finding organization. On March 4, the Division announced the establishment of machinery for price adjustments under the provisions of Sec. 4 II (d) of the act. On March 23, the examiners in charge of the price hearings started filing portions of their report and recommendations. Recommendations as to maximum discounts to registered distributors were filed March 28. Filing and mailing of price schedules was completed on April 23. Oral arguments on exceptions closed on June 6. On June 19, maximum discounts to be made to registered distributors, as well as the rules and regulations for the registration of distributors and farmers' cooperatives, were released.

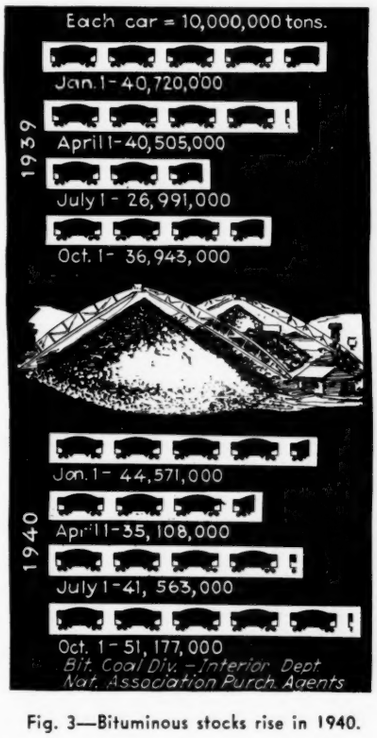


Fig. 3—Bituminous stocks rise in 1940.

Price Date Set

July 24 was marked by an announcement that prices would become effective Sept. 3. Prices proposed by the director had been partly mailed out on that date, with completion of mailing on Aug. 3. On Aug. 16, the Division fixed Oct. 1 as the date for prices to go into effect. Hearings on supplemental price schedules were held Aug. 20-24, and on Sept. 24 Secretary Ickes modified in certain respects the price schedules, marketing rules and regulations and rules and regulations relating to discounts to distributors and their registration. At the same time, the 30-day contract restriction was removed as of Nov. 15. On Sept. 30, an announcement was made that supplemental price schedules would go into effect Oct. 7.

General Docket No. 19 was established by an order dated Sept. 28 and was directed toward prohibition of the sale of coal for which no prices had been established, interested persons being given until Oct. 7 to show why an order should not be issued against such sale. Hearings in General Docket No. 18, dealing with orders for the submission of data on preparation, cost, sale and distribution of coal, began Oct. 1 and were concluded Oct. 4. Hearings in General Docket No. 20, concerned with a revision in marketing rules and regulations governing appointment of sales agents, were held Oct. 14.

Although some modifications were made in rules and regulations and other items governing marketing during the remainder of 1940, the attention of the Bituminous Coal Division was directed largely to requests for exemption, complaints of violations, which totaled 468 at the end of the year, and Sec. 4 II (d) petitions for relief, totaling 536 at the end of the year. District Board No. 11 (Indiana) was first under the gun with a petition for relief (Docket No. A-1) to permit competition in certain market areas with dock coals, on which hearings were begun Sept. 27. Subsequent petitions ran the gamut from requests for new prices to changes in moisture

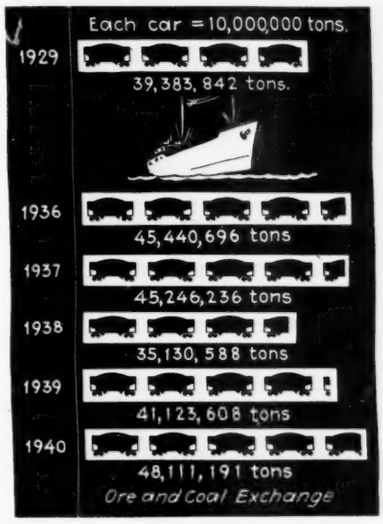


Fig. 4—Lake shipments hit new high in 1940.

allowances. An important group was concerned with relief on fuel for railroads, certain public utilities, public institutions and similar consumers, while others were concerned with prices on coal moving by water. In general, the Division was disposed to grant temporary relief pending final hearings.

But while petitions for relief were numerous, few companies took cases into court or made basic attacks on price-fixing procedure. Constitutionality of the Guffey-Vinson Act was upheld by the Supreme Court in a decision handed down May 20. The court upheld application of the 19½-percent tax against noncode members, declared that the act was within the regulatory powers of Congress under the commerce clause of the Constitution, and was not violative of the Fifth Amendment, and that there was no invalid delegation of legislative power.

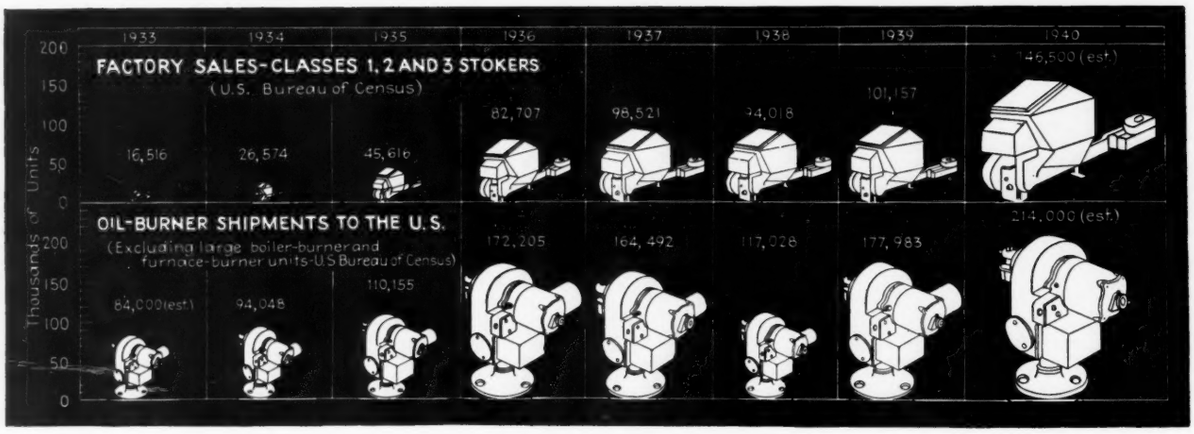


Fig. 5—Small-stoker gains run ahead of oil burners in 1940.

Suspension of price schedules to permit rehearing, reargument and reconsideration was requested by Associated Industries of New York and the Carter Coal Co. in separate petitions early in October. These petitions were denied by Secretary Ickes Oct. 23. Court cases included a request by the Keystone Mining Co. for a review of an order denying exemption filed with the Third District Circuit Court of Appeals, which granted a motion for a stay July 16. The cause was argued Nov. 7, with a decision pending.

Price Review Asked

A complete judicial review of the price-fixing procedure was requested in a petition filed Oct. 7 with the Seventh District Circuit Court of Appeals by the Ayrshire-Patoka Collieries Co., Pyramid Coal Corporation, Hickory Grove Coal Mining Corporation and the Clinton, Standard, Mariah Hill Super Block, Central Indiana and F. C. Morgan coal companies. This and a petition of the Wheeling Township Coal Mining Co. (Sixth District Court) requesting review of certain prices still were pending at the end of the year. One ruling on a request for a stay against prices and marketing regulations, however, was handed down in 1940, being a denial of a motion by the Powhatan Mining Co. and the Ohio & Pennsylvania Coal Co. in the same Circuit Court of Appeals. Hearing on the merits of the petition for review of certain prices was set for Feb. 3, 1941.

Satisfaction with the working of the price-control system in its initial months was expressed late in the year by Secretary Ickes, who indicated that he would ask for a two-year extension.

Competition was again a major item in the bituminous picture in 1940. On the basis of eleven months' figures by the U. S. Bureau of Mines, consumption of gas oil, distillate fuels and residual fuel was 8½ per cent ahead of 1939, making the 1940 total about 490,000,000 bbl., including some 110,000,000 bbl. consumed by domestic oil burners, of which 2,050,000 were estimated to be in operation at the end of the year.

This burner total reflects the fact that shipments of domestic and commercial units (excluding large boiler-burner and furnace-burner types) to the United States, on the basis of Bureau of the Census figures, reached an estimated total of 214,000 in 1940, an increase of 20.2 per cent over the 1939 figure of 177,983 units. In contrast, factory sales of Class 1, 2 and 3 stokers (domestic, commercial, etc., up to 300 lb. per hour) staged a 44.9-per-cent increase to an estimated total of 146,500 in 1940, compared with 101,157 in 1939. The 1940 total includes some 13,000 anthracite residential stokers, compared with 11,776 in 1939.

Stove Sales Up

Stokers were not the only type of coal-burning equipment to take a spurt in 1940. The Locke "Warm Morning" heater, for example, sold like hot cakes, with over 12,000 retail coal, lumber and hardware dealers in 40 States and Canada pushing it at the end of the year. Designed for coal, coke or briquets and characterized as the only new idea in stoves in 50 years, the heaters were being shipped from five factories in Missouri, Tennessee, Illinois and Ohio. Users included a large number of coal companies (mine offices, scale houses, preparation plants, etc.). Media carrying advertising on the heater included 14 farm papers and 21 newspapers from Alabama to Utah. Replacement of natural gas and fuel oil has been reported in a substantial number of instances.

Consumption of oil, gasoline and diesel fuel in yard and road-train services by Class 1 railroads (Fig. 6) increased about 8.3 per cent in 1940; coal consumption rose 6.4 per cent. Last year was marked by a start on equipping 52 Baltimore & Ohio and Alton locomotives with a new front-feed stoker worked out in the B. & O. shops. Tests show substantial increases in firebox temperature and superheat, a reduction of up to 50 per cent in losses of coal out the stack, an increase of 15.5 per cent in evaporation per pound of coal and a 15.9 per cent fuel saving per 1,000 gross ton-miles.

Utilities Use Less Oil

Electric-utility oil consumption showed a decrease of 4.8 per cent in 1940, while natural-gas use dropped 4.7 per cent. Coal consumption, on the other hand, was up 15.6 per cent. The installed capacity of fuel-burning central stations was increased 1,430,000 kw. in 1940, or more than three times the 400,000-kw. rise in hydro capacity. New steam plants scheduled for 1941 are reported to have an aggregate capacity of 2,400,000 kw., with a further addition of about 1,800,000 planned so far for 1942. Hydro projects scheduled for 1941 have a capacity of 1,550,000 kw.; 1942, 560,000 kw.

Total natural-gas sales in the United States, on the basis of reports to the American Gas Association, increased 8.8 per cent in 1940. Increases by classifications were: domestic, including house heating, 12.4 per cent; commercial, 12.5 per cent; industrial, 9.9 per cent. Utility consumption was down 4.6 per cent. Sales of manufactured gas were up 7.7 per cent in 1940, with increases of 2.1 per cent in domestic, 25.1 per cent in house heating,

and 7.7 per cent in the industrial and commercial classifications.

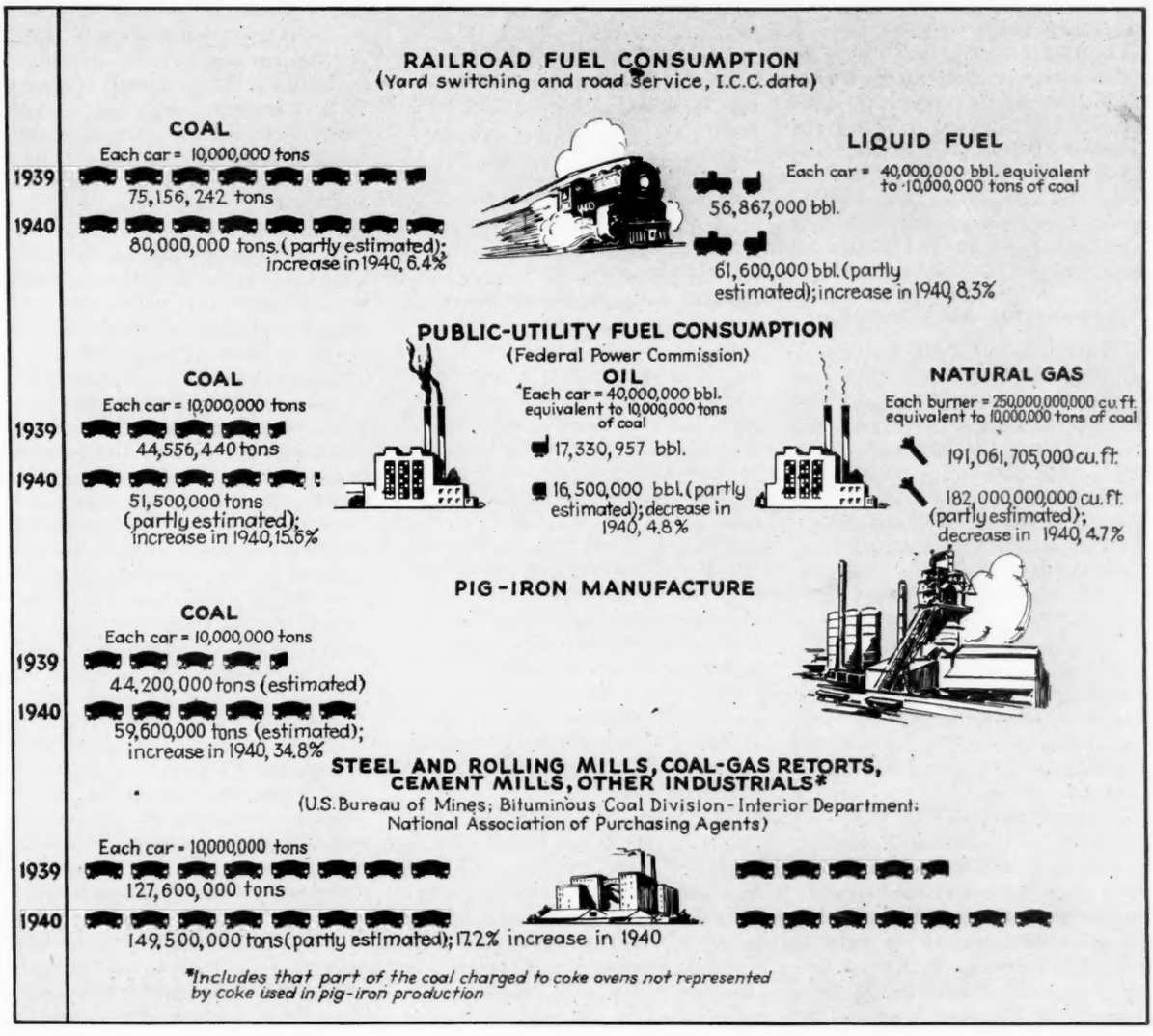
More favorable rates for central heating plants were offered in 1940. During 1939, gas utilities reported that of the new homes constructed in their territories, 91 per cent used manufactured or natural gas for cooking, 77 per cent for water heating, 62 per cent for house heating and 12 per cent for refrigeration. Further increases are expected in 1940, the American Gas Association reports, stating also that "an impressive record of gas service has been made in the housing projects completed . . . during 1940, and the industry is supplying gas for many services in numerous cantonments and defense housing projects throughout the nation."

Pressure for new hydro projects, as the figures given previously indicate, was substantially reduced in 1940, although several new projects were offered and the St. Lawrence Seaway was brought out of the closet again at the end of the year on defense grounds. Vigorous opposition was registered by the industry through the National Coal Association and local operator groups, with labor cooperating. A hard-fought campaign was waged against extension of the Trade-Agreements Act, under which, among other things, the tariff on oil imported from Venezuela was cut, but it was finally adopted by a 3-vote margin in the Senate in April.

N.C.A., local operator groups, mine workers and cooperating transportation and heating-equipment industries also spent a busy year opposing proposed natural-gas pipe lines before the Federal Power Commission and local public-utility commissions. One was the Texas-Philadelphia-New Jersey-Metropolitan New York line noted earlier in this article. Other projects were designed to extend natural-gas service in Tennessee, Indiana, Wisconsin and other States. Few reached the approval stage in 1940.

Bituminous coal and affiliated interests intensified advertising and promotional work in 1940 and laid plans for additional research to hold and regain markets. Research interest was reflected in the wide variety of projects listed in the article starting on p. 86 of this issue. Late in 1940, Bituminous Coal Research, Inc., launched its new three-year $200,000 program designed to advance coal by developing better equipment for its use in home and industry. Arrangements were made with the Battelle Memorial Institute to carry out the program, which will include improved control of heating, smokeless operation, direct use of coal as a fuel in metallurgical and ceramic work, complete gasification for domes-

Fig. 6—The coal picture, compared with competitive fuels, in certain industries in 1940.


RAILROAD FUEL CONSUMPTION
(Yard switching and road service, I.C.C. data)
COAL
Each car = 10,000,000 tons
1939
75,156,242 tons
1940
80,000,000 tons (partly estimated); increase in 1940, 6.4%
LIQUID FUEL
Each car = 40,000,000 bbl. equivalent to 10,000,000 tons of coal
56,867,000 bbl.
61,600,000 bbl. (partly estimated); increase in 1940, 8.3%
PUBLIC-UTILITY FUEL CONSUMPTION
(Federal Power Commission)
COAL
Each car = 10,000,000 tons
1939
44,556,440 tons
1940
51,500,000 tons (partly estimated); increase in 1940, 15.6%
OIL
*Each car = 40,000,000 bbl. equivalent to 10,000,000 tons of coal
17,330,957 bbl.
16,500,000 bbl. (partly estimated); decrease in 1940, 4.8%
NATURAL GAS
Each burner = 250,000,000,000 cu. ft. equivalent to 10,000,000 tons of coal
191,061,705,000 cu. ft.
182,000,000,000 cu. ft. (partly estimated); decrease in 1940, 4.7%
PIG-IRON MANUFACTURE
COAL
Each car = 10,000,000 tons
1939
44,200,000 tons (estimated)
1940
59,600,000 tons (estimated); increase in 1940, 34.8%
STEEL AND ROLLING MILLS, COAL-GAS RETORTS, CEMENT MILLS, OTHER INDUSTRIALS*
(U.S. Bureau of Mines; Bituminous Coal Division-Interior Department; National Association of Purchasing Agents)
Each car = 10,000,000 tons
1939
127,600,000 tons
1940
149,500,000 tons (partly estimated); 17.2% increase in 1940
*Includes that part of the coal charged to coke ovens not represented by coke used in pig-iron production

tic and commercial uses, use in internal-combustion engines, development of improved stokers, kitchen ranges and space heaters, and better dustproofing, particularly with porous coals.

Industry promotional work headed up in the advertising campaign carried on by the National Coal Association, using *American Home, Better Homes and Gardens, Architectural Forum, American Builder, Building Reporter, Building Products* and *Fortune*. These advertisements, designed to carry the comfort, convenience and economy message to home owners, architects, building owners and managers, and the general public, were supplemented by two new pamphlets: "Unmasking the Great American Delusion That 'You Have to Be Cold to be Healthy,'" and "Flue Planning for Modern Homes." Retailers were told about the "Unmasking" pamphlet and about the industry's general promotional campaign in advertisements in leading national coal-trade publications.

The 1940 campaign was completed in September, and in the first eight months, among other benefits, 3,295 requests for "Unmasking the Great American Delusion" and 3,121 requests for the "Modern Basement Plan Book," brought out in 1939, were received. Requests came in from every State and Territory and 15 foreign countries.

Prepare for Ad Campaign

Preparations for a new nation-wide campaign were laid by the association in June when Arthur Kudner, Inc., was engaged as advertising counsel to prepare a detailed cooperative plan. The association's board of directors recommended adoption of the plan on Nov. 15. Meetings of operators and allied interests were held in New York, Cincinnati and Chicago in December to study the program, with others scheduled for the new year. Substantial support was reported. The plan calls for the expenditure of about $900,000 annually for advertising, market promotion and public relations. Funds supplied by subscriptions on a tonnage basis are to be administered by an operating corporation known as Bituminous Coal, Inc.

Regional and individual promotional work by both bituminous coal and allied distribution and equipment industries reached a new high in 1940. An outstanding example—a cooperative stoker campaign in Kansas City and surrounding territory by coal operators in Kansas, Missouri and Oklahoma, stoker men, retail dealers and the Kansas City Power & Light Co.—was continued for its second year with gratifying results. Marked interest by a number of utilities in other regions was a byproduct.

Coal men and allied interests increased participation in better homes shows and put on exhibits of their own on an increasing scale. Renewal of the Kansas City program was coincident with the eight-day Kansas City Better Homes Show, with ten or more leading stokers on display. On April 23-25, the operator committee sponsored a special coal-stoker clinic and show. Early in the year, also, plans were laid for an automatic-heat program in Nashville, Tenn., with stoker and equipment distributors lending cooperation.

Coal at Home Shows

The industry, through the Chicago Coal Merchants' Association, the Committee of Ten—Coal and Heating Industries, the Mid-West Stoker Manufacturers' Association and other interests, was well represented at the National Homes and Gardens Exposition at Chicago May 4-12. A "Heat With Coal" display was put on in Chattanooga, Tenn., starting July 15. Coal and equipment interests were on the job at the 26th Annual Cincinnati Food Show Aug. 20-Sept. 6, while a similar exposition was put on in Muncie, Ind., Sept. 16-21, preceded and followed by an intensive advertising and promotional drive.

The Stoker Manufacturers' Association adopted on Nov. 15 a program designed to level out the stoker-sales curve and also secure a larger part of the new-home business. In December, the Mid-West Stoker Association and the Chicago Coal Merchants' Association opened a permanent stoker and coal display in the Chicago Merchandise Mart. Meanwhile, on the strength of an 18-per-cent increase in sales of automatic coal-burning equipment and a 15-per-cent decrease in sales of competitive fuel-burning units in the 1939-40 season, the Utah Coal Operators' Association and stoker interests decided to continue their promotional campaign in Utah and surrounding territory.

A number of promotional campaigns in 1940 tied in with the N.C.A. theme of more comfort with coal. This was the case, for example, with a campaign run by coal and allied interests in Greensburg, Ind., and by a Wyoming producer. In Colorado, the Coal Service Bureau of Northern Colorado Coals, Inc., got good results with the reciprocity theme widely used by coal men in 1940. The principle of cooperation and concentration on new homes was epitomized by promotional work by the Milwaukee Solid Fuel Institute, composed of retailers, dock operators and stoker sales agencies. A similar institute was organized in St. Louis by coal men and equipment interests.

Smoke to the Fore

The problem of smoke control moved farther to the front in 1940. St. Louis was easily the center of interest as a result of passage of an ordinance on April 8 requiring either the use of smokeless fuel or mechanical firing equipment burning other types without smoke. The ordinance also empowered the city to purchase smokeless fuel wholesale and distribute it if an adequate supply could not be obtained through the usual channels. Plans immediately were laid for securing Arkansas smokeless coal and to that end the Frisco railway proposed first a reduced rate of $2.75 per ton on coal from Arkansas and Oklahoma mines and later a $2 rate on 2,000-ton trainload lots from Fort Smith to St. Louis. The first such trainload reached St. Louis early in July. Later in the year, the $2.75 rate was established by other carriers serving the Arkansas-Oklahoma group.

Passage of the ordinance had widespread repercussions in Illinois, where work already was under way on a study of smokeless briquet production, as well as other methods of rendering Illinois coal smokeless. An act of the Illinois Legislature empowering counties to build or acquire processing plants was approved by the governor late in June, following which St. Clair County, across the river from St. Louis, embarked on a study of construction and financing possibilities for such an installation. In September, Southern Illinois Coals, Inc., made up of a number of producers in the region, appointed a market specialist to work for a restoration of the St. Louis business.

Tests of processed coal were started in Nashville, Tenn., early in 1940. Birmingham, Ala., set up a smoke-control committee preparatory to developing a control code and an adequate inspection system later in the year. Louisville, Ky., took under advisement a proposal to construct a processing plant for the production of smokeless fuel, and late in 1940 Atlanta, Ga., passed control ordinances and appointed a new smoke inspector.

GUFFEY ACT EXTENSION

For Two More Years Wins 3 to 1

In Poll of Bituminous Mine Executives

Unless affirmative action is taken by Congress, the Guffey-Vinson minimum-price control law expires by statutory limitation April 26, 1941. A two-year extension has been recommended. How does the bituminous industry feel about such an extension? What have been the results of the operation of the law to date? Answers to these questions, based upon a poll of coal-company presidents in all parts of the country, are given in this article.

EXTENSION of the Guffey-Vinson minimum-price law for another two years is favored nearly 3 to 1 in returns from a poll of bituminous producers made by *Coal Age* last month. Every major soft-coal-producing region but one—the Southwest—gave the suggestion a substantial majority. The weighted average for all producing fields combined shows 73.8 per cent of the operators expressing an opinion on the subject voting for the extension. Approximately 90 per cent of this group indorsed the extension proposal without qualifications. The vote by regions is set forth in Table I.

With few exceptions, these same operators reported that their average realizations during the first three months Guffey-law minimum prices were in effect had increased over the figures for the last quarter of 1939. Part, if not all, of this increase, in the opinion of a number of producers, was due to the general upturn in industrial demand rather than governmental price fixing. Increases in realization ranged from 3 to 70c. per ton, with increases of 10c. to 25c. in the majority. Decreases in realization reported by individual operators ranged between ½c. and 25c.

These and other data here presented are based upon replies to a letter questionnaire sent out the middle of January to a selected group of presidents of bituminous coal-mining companies. All fields and all sizes of commercial operations from companies with annual outputs in excess of 1,000,000 tons to individual mines with a rated capacity of 100 tons per day were included in the group and represented in the returns. Up to the time of going to press, replies had been received from every coal-producing State except Maryland, Michigan and Texas.

Distribution of replies by producing regions was as follows: southern Appalachian (including Alabama), 21.4 per cent; northern Appalachian, 37.9 per cent; Midwest, 17.2 per cent; Southwest (including Iowa), 9.0 per cent; Rocky Mountain States (including Washington), 14.5 per cent. On the basis of actual tonnage produced in these five grand divisions, this distribution gives disproportionate weight to the returns from the Southwestern and Rocky Mountain States and insufficient weight to the Appalachian regions. The national figure for the percentage favoring extension, therefore, probably is an understatement.

Seven questions were asked the coal-company presidents by *Coal Age*. The questions were:

1. Was your average realization per ton for the last quarter of 1940 more or less than for the last quarter of 1939?
2. What was the actual change in cents per ton?
3. Have you lost any tonnage to competitive fuels or other coal districts because of price regulation?
4. If so, how much and to what fuels or coal districts?
5. Have you gained any tonnage from competitive fuels or coal districts because of price regulation?
6. If so, how much and from what fuels or coal districts?
7. Do you favor a two-year extension of the present law?

As previously stated, reports of decreased realizations were in the minority. Only 11.5 per cent of the operators answering the first question said their average realizations had been reduced. The heaviest cut—25c.—was reported by an Ohio operator. No decline in average realization was mentioned by any producer in the southern Appalachian group. The range for the few cases in the northern Appalachian group was 5 to 25c. per ton; in the Midwest, 3 to 8c.; Southwest, 5 to 7c.; Rocky Mountain States, ½c. to 11c. per ton.

The 88.5 per cent enjoying higher realizations the last quarter of 1940

Table I—How the Operators Voted

Region	Percentage Favoring Extension			Percentage Opposed
	Unqualified	Qualified	Total	
Southern Appalachian	77.4	9.7	87.1	12.9
Northern Applachian	67.3	7.2	74.5	25.5
Midwest	68.0	...	68.0	32.0
Southwest	30.8	15.4	46.2	53.8
Rocky Mountain States	66.7	9.5	76.2	23.8
Total	66.2	7.6	73.8	26.2

saw these figures increase from 3 to 70c. over the average realizations for the final three months of 1939. In the southern Appalachian region these increases ranged from 3 to 30c. per ton; in the northern Appalachian area the range was 4½ to 70c. The top figure came from Ohio, which also reported the top figure in reduced realization. Increases in average realization in the Midwest were from 6 to 63c. per ton; in the Southwest, from 6 to 68c., and in the Rocky Mountain States, from 6 to 66c. per ton.

Business Losses Reported

Loss of business to other producers and districts or to competitve fuels as a result of minimum-price control was reported by about 35 per cent of the executives cooperating in the *Coal Age* poll. Shifts stated in actual tonnages started with a low of 600 tons and ran as high as 200,000 tons. The 600-ton shift—most of it to gas—suffered by a Missouri strip mine—was offset by the gain of an equal tonnage from another producing district in the same State.

A shift from coal to fuel oil for railroad-locomotive service in the Rocky Mountain area was responsible for the 200,000-ton loss. While this is not the first business lost to oil in that section, Guffey price control, in the opinion of the operator, made it impossible to meet the fuel-oil competition. This complaint that fixed minima on coal put it at a disadvantage in competing against fuels not so regulated is echoed by several producers. Some of the staunch supporters of the Guffey act express the opinion that that control cannot attain the desired objectives until gas and oil are similarly regulated.

The majority of coal-company executives, however, either reported no changes in the competitive situation or felt that the time had been too short to arrive at any definite conclusions. Weather conditions, industrial demand and consumer stocking prior to Oct. 1, 1940, they point out, all may have obscured the picture of what the buyer plans to do in the future. Some operators who reported no losses in the first three months of minimum-price operation voiced fear that substantial shifts would take place with the new coal year.

Territorially, tonnage shifts and losses to oil and gas appear to increase in number and intensity as the survey moves westward. Few actual losses are reported by southern Appalachian operators. One eastern Kentucky executive stated he had lost 35 per cent of his tonnage to Ohio and Pennsylvania; another company in District 8 lost approximately 10,000 tons to District 13 operations. The other side of the picture was presented in reports of business shifting from Ohio to southern West Virginia and in increased sales of low-volatile coals at the expense of high-volatile mines.

Most of the shifts reported from Pennsylvania were from one district to another within that Commonwealth. Some rail mines in the State lost semi-local business to trucking operations serving domestic consumers. District 3, said one operator, walked away with an order for 5,000 tons monthly formerly coming from western Pennsylvania. In more distant markets, fuel-oil competition has been increased, with public-utility shifts to fuel oil in Greater New York cutting down Pennsylvania coal shipments.

Complaints of shifts and losses to competitive fuels were still more numerous in Ohio. Blocks of 25,000 to 30,000 tons slipped to Pennsylvania and northern West Virginia, while Southern coals made further inroads in Ohio tonnage. Within the State itself, operators with coals of lower B.t.u. value found the going tougher against coal of higher value. Slack competition for Cleveland business from Pittsburgh and Fairmont is no bed of roses for Ohio since minimum prices became effective. While one Ohio shaft mine complained of losses to truck strip mines, a stripping operation declared the code price differential between deep-mined and strip coal had cost it 66⅔ per cent of its business.

Tonnage Shifts Intrastate

Illinois operators generally take a philosophical view of the shifts in tonnage which have developed in their State. For the most part their attitude is that some upsets were inevitable in initiating the price-control system and that inequalities and discriminations will be ironed out. Some producers have gained tonnage from competitors in their own district who prior to last October sold at lower price levels. Oil and gas have taken some additional business in Illinois and Wisconsin since code prices became effective and one sizable order was captured by a diesel plant. In Indiana, too, most of the shifts have been internal or to Illinois.

Shifts to other mines within the district, to other code districts, and to gas and oil are reported in the Southwest. Some Arkansas business has gravitated to District 15. And smaller operators in District 15 complain that they have lost business to the larger companies in the same district and also to natural gas. One off-line railroad order for 25,000 tons, it is stated, has been transferred from Kansas to Illinois mines. Oklahoma has won some business from District 14 and experienced some shifting of tonnage within its own borders, with strip mines in certain cases the beneficiaries of the switch.

Colorado is another State which has witnessed considerable shifting of business since last October. One operator reports the loss of 10,000 tons to oil and gas; another, a 20 per cent decline due to increased inroads of these competitive fuels. A third producer has offset small losses to Oklahoma and Colorado lignite with gains in stoker-coal tonnages from the northern lignite field of his State. Complaint is made in some quarters that unscrupulous operators are putting mines living up to code prices at a disadvantage by "bootleg" quotations. Oil and gas are a bigger headache for New Mexico coal producers tied to minimum prices. Fuel-oil competition also is a problem in Washington.

Opinions Differ

Increased realizations and minimum tonnage losses to competitive districts and fuels might reasonably be expected to make producers favor an extension of the act. But not always. Nor is size of operation a determining factor. Some of the most outspoken—and at times sulphuric—opposition comes from operators whose average realization for the last quarter of 1940 was greater than for the corresponding period in 1939. And some of the producers who feel that they temporarily have lost business as a result of minimum-price control want to see the experiment continued.

Those who qualify their indorsement of the proposal to extend the act make one or more of the following provisos: That the law be properly enforced and policed; that "some inequalities" in price structure be ironed out; that some limits be put on the number of distributors competing with regular sales companies; that delivered prices on trucked coal be more closely supervised; that district boards be eliminated and classification be put on "a better basis"; that oil and gas also be regulated.

BITUMINOUS MECHANIZATION

Gains Added Impetus in 1940

With Conveyor Installations Sharply Up

WIDESPREAD gains in mechanization of loading, particularly in the field of conveyor installations, featured bituminous developments in 1940. New mobile-loader installations were supplemented by additions to existing equipment, while rubber-tired haulage staged a major advance. Mobile loaders also continued their gains in the thinner seams, although these still were the principal province of conveyors of various types, including shaker units with self-loading heads—also installed in considerable numbers in thicker coal.

Sales of mobile loaders totaled 233 in 1940, a decrease of 20.2 per cent from 292 in 1939, according to compilations by the Bituminous Coal Division and the U. S. Bureau of Mines (see p. 59). The number of mobile loaders in service at the end of the year, independent estimates indicate, was about 1,875.

Sales of bituminous conveyors aggregated 1,573 in 1940, including a number for use behind loading machines, although such installations were limited by the growth of rubber-tired haulage. Sales in 1939 totaled 1,095, making the 1940 increase 43.7 per cent. In 1938, in contrast, conveyors in use totaled 1,872. Available data also indicate that about 155 rubber-tired haulage units were shipped to bituminous mines in 1940, compared with around 70 in 1939.

Paralleling the installation of rubber-tired equipment and conveyors behind loading machines, several companies last year adopted the big-car and transfer-station system pioneered in 1937 at the Wasson No. 1 mine, Wasson Coal Co., Harrisburg, Ill. One company also adopted self-discharging scrapers to take coal from loading machines or hand loaders to chain conveyors. Installation of larger cars with the conventional locomotive changing system also was active in 1940. Revisions and additions to other auxiliary equipment continued at a good pace.

Mechanical-mining advances were well distributed over the United States in 1940, although perhaps the greater activity, as might be expected, was in the Appalachian region. In the Far West and Rocky Mountain States, which include highly mechanized Wyoming, as well as seams ranging from extremely thick to very thin, operators called on all types of equipment.

Washington companies adding to equipment include the Continental Coal Co., which installed a Gardner-Denver mine-car loader and an Ingersoll-Rand slusher-loader. A steeply pitching seam limits mechanization work. A new underground hoist with motor and auxiliaries was installed to permit further development.

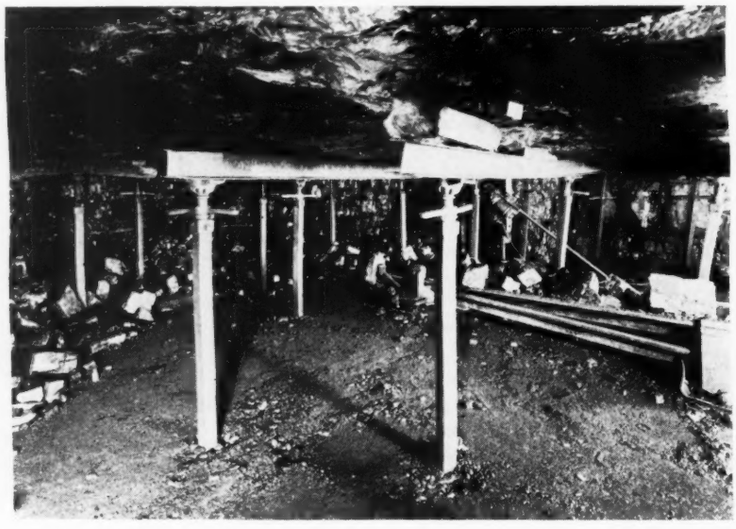
Driving of additional auxiliary slopes and inclines and installation of four additional 300-hp. hoists were among activities at Northwestern Improvement Co. mines in Washington.

Driving entries across heavily pitching ground (May, 1937, *Coal Age*, p. 183) with shaker conveyors and conveyor-elevators was extended and improved in 1940. Three more elevators fitted with 15-hp. Westinghouse approved-type motors were built. Another project was a relief airway of two raises on a 30-deg. pitch through 500 ft. of rock from the

Mobile loaders, such as this one taking off the bench above a middleman, went into additional operations in 1940.

Roslyn to the overlying big seam, thence 3,600 ft. to a fan. The section in the coal is being driven downward on a maximum pitch of 12 deg. Since this was too steep for shaker conveyors, a portable belt outfit 100 ft. long (24-in. belt) was built.

The outby end of the belt is elevated to discharge onto a short chain conveyor bolted onto the front car of the conveyor assembly. This chain places the coal in cars on an adjoining track. The coal is shoveled onto the belt by hand, "but, as it has to be lifted only about 2 ft. and as eight cars can be loaded without stopping for changing, the outfit showed a marked improvement" over loading directly into cars. A small hoist pulls the conveyor back during cutting and shooting.



Conveyor activity was featured by widespread installation of shaker units with self-loading heads.

Utah added both loading machines and conveyors in 1940. The Liberty Fuel Co., as an example, installed one Joy 8BU loader and a Sullivan 7-B shortwall, selling two old shortwalls. Loading equipment gradually is being changed to Joy units, the company states, because stoker demand is expanding at the expense of lump. Another Utah company, using 11BU, Goodman 260-A and Jeffrey L-400 loading machines, supplemented by shaker conveyors with Goodman automatic duckbills, added a Jeffrey 56-A track drill in 1940, and installed a Sullivan drill on one of three Sullivan 7-AU cutters with the loading machines. Shortwalls are used with the conveyors. Considerable pillar coal was mined with both loading machines and conveyors.

Wyoming, Montana and Colorado were other States expanding loading and conveying equipment and auxiliaries. Frederick mine, Colorado Fuel & Iron Corporation, for instance, acquired 75 new cars, two locomotives, one charging set, four shaker conveyors and four mining machines. Two shaker conveyors were added at Crested Butte. The Oliver Coal Co., Somerset, Colo., using mobile equipment, added a changing locomotive and 25 new steel cars holding 1,500 lb. more coal. Other equipment included one Sullivan 7-B shortwall and a Jeffrey A-6 post drill. Three men, with this machine and drill, can prepare upward of 400 tons per shift in 6½-ft. coal. The Cardox coal-breaking system was being installed at the end of the year.

Two trolley-and-cable-reel "shuttle cars" were built by the Domestic Coal Co. in 1940 to serve two Joy 5BU loaders ("Red Devil" pit-car loader for standby) at the Streeter mine, Craig, Colo. This operation, with a daily capacity of 350 tons, moves its coal by truck—60 per cent to railhead 28 miles away.

Developments in the Southwest in 1940 included additional conveyors, particularly in Arkansas and Oklahoma. Two room units, consisting of a Jeffrey 61-AM and 61-HG conveyors, were installed in 1939 and 1940 to completely conveyorize Sans Bois mine, McCurtain, Okla., producing 150 to 175 tons per day of two shifts when roof conditions are normal. Rooms are driven 60 to 100 ft. wide and 300 to 375 ft. deep. Bands in the coal, 3 ft. 8 in. to 4 ft. thick, are cut out or picked out in loading.

Illinois and Indiana made a few additions to loading machines in 1940 and also bought several conveyors, including a number for use behind loading machines. Several additional shuttle cars went into service. Indiana developments, in particular, were featured by preparation for or the opening of four new mechanical mines by the Ingle Coal Co., Standard Coal Co., Linton-Summit Coal Co. and Waukee Coal Corporation. Existing operations in both States, however, largely confined their efforts to additions to auxiliary equipment and research into improved operating practices. In Illinois, as an example, the Mt. Olive & Staunton Coal Co., using 5BU equipment, experimented with cutting higher in the seam, continued replacement of mules with locomotives and completely rebuilt its mine cars. Original steel cars with wood bottoms and plain bearings, holding 87 cu.ft., were reconstructed with steel bottoms, roller-bearing trucks and higher sides and ends, increasing capacity to 107 cu.ft. Supplemental benefits were a reduction in power consumption and future maintenance costs.

Big Cars Serve Loaders

Over a year of successful operation with big "transfer" cars was completed at the Kings mine, Princeton Mining Co., Princeton, Ind. Under this system, pioneered by the Wasson Coal Co., loading machines are served by large cars which bring the coal to a transfer station for reloading into the regular cars for haulage and hoisting. At Kings, transfer units consist of 10-ton Sanford-Day cars with six drop-bottom doors. Each car is accompanied by a locomotive, and three such units follow a loading machine when the haul reaches its maximum. Six doors are used per car to shorten their length and reduce the brushing required for height over the transfer hopper, which consists of two standard Jeffrey 61-EF chain conveyors with sideboards to make a hopper some 40 in. deep. These conveyors dump onto two similar cross conveyors which load the regular mine cars in adjacent headings. Use of the big cars, to be described in an early issue, has increased loading-machine output 20 to 30 per cent. Additional units are planned, while a similar system was installed by a second Indiana operation in 1940.

Additions also were made in 1940

to rubber-tired equipment in western Kentucky, where developments included a major increase in conveyor installations, particularly shakers with self-loading heads, several with mother belts.

Ohio, with 178 units, stood third in the list of States installing conveyor equipment. Shaker conveyors and duckbills led the field. Ohio also added substantially to its loading-machine total and went in for rubber-tired haulage on an increasing scale.

Pennsylvania led in the adoption of mobile loading machines and rubber-tired haulage units in 1940, and also installed a substantial number of conveyors. Activity was particularly marked in central Pennsylvania, where, in addition to conveyors, many loaders and rubber-tired haulage units went into service, some in coal as low as 3 ft.

Conveyor Units Added

Western Pennsylvania was not far behind, with such organizations as the Pittsburgh Coal Co. adding to its complement of mobile loaders, extending entry belts, developing further the use of room conveyors with Joy loaders with the drawslate held up, adding to duckbill equipment, installing track-type "shuttle cars" (big drop-bottom mine cars) behind loading machines, replacing several open-type locomotives with flameproof units and installing 500 5½-ton stub-axle cars at Westland mine to replace the original 2.4-ton units. Nemacolin mine, Buckeye Coal Co. (Youngstown Sheet & Tube Co.), was another to increase mechanical-loading equipment, accompanying the new units with universal cutters and track-mounted drills.

West Virginia was the second largest purchaser of loading machines, many with rubber-tired haulage equipment, and installed 724 out of the United States aggregate of 1,573 conveyors. Most of the conveyors went into the central and southern fields. Loading machines were fairly well distributed over the State. Auxiliaries were not neglected, Jones Collieries, Inc., Rachel, planning, as a case in point, the installation of track-type "shuttle cars" early in 1941.

Additions to equipment at the Koppers Coal Co. properties in West Virginia and other States included twelve shuttle cars with auxiliary equipment, eleven loading machines, 57 conveyors and 220 steel mine cars. Conveyor installations in southern West Virginia included two Ladel shakers by the Coalburg-Kanawha Mining Co., plus locomotives and cutting machines. Jeffrey chain and Ladel shaker conveyors, plus Smith pit-car-loaders, or "scooters," were installed in four mines of the New River Co. (room-and-pillar system).

A new conveyor operation, No. 9-X, duplicating the No. 7 property (*Coal Age*, April, 1939, p. 51), was opened in the Powellton seam by the Carbon Fuel Co. Chain and belt conveyors powered by 220-volt a.c. motors move coal from the face to the surface. Sullivan "Lo-Hite Rockloaders" were acquired for entry-driving and other work by Koppers, Pardee & Curtin Lumber and New River companies.

Eastern Kentucky and Virginia added substantially to loading machines, shuttle cars and conveyor in 1940. In eastern Kentucky, for example, the Octavia Coal Mining Corporation mechanized about 40 per cent of its mines with Joy loaders for entry driving. In Virginia, the Kemmerer Gem Coal Co. made a start on mechanical mining with a Goodman G-12½ shaker conveyor, A-1-G automatic duckbill, 212-AR shortwall cutter and Brown-Fayro Model BC tubing blower, now driving a main entry in a new opening.

Tennessee developments in 1940 revolved around new conveying equipment, including shakers with duckbills. Alabama, on the other hand, installed practically all types of equipment, including loading machines, scrapers and conveyors—the latter largely of the shaker type, many with duckbills. Scraper purchasers included the Cane Creek Mining Co. (three Sullivan units) and the Barney mine, Alabama By-Products Corporation (two Sullivan machines). Barney also got 25 new steel cars, replacing old-type wood units. Fifty new steel cars replaced old units at the company's Bradford mine. Four chain conveyors and three shakers were added as another step in the mechanization of this property.

Track-mounted loading machines are employed to rip out and gob a heavy parting in the Mary Lee seam at the Sayreton No. 2 mine, Republic Steel Corporation, which got well started on its mechanical-mining program in 1940. Like many other recruits, Sayreton accompanied loading machines with new track-mounted cutting machines, hand-held drills and 5-ton steel cars, replacing old 2½-ton wood equipment. Pillars are "pushed out" by working from the inside toward the gob. Mining is based on cutting just over the parting, loading the top bench by elevating the front head of the machine, a special high-turntable unit, and then dropping the head to rip out and gob the parting behind board fences or in special gobbing bays, after which the bottom bench is shot and loaded. An article on Sayreton is scheduled for March publication.

Several installations of large "transfer cars," such as this one shown over the transfer conveyors, were made in 1940.

BITUMINOUS STRIPPERS

Install Shovels and Draglines And Adopt Larger Automotive Haulage Units

NEW OPERATIONS, new stripping and loading equipment, new drilling equipment and practices and increased use of automotive transportation, along with major increases in unit capacity and substantial gains in diesel engine installations, were features of an active year in bituminous stripping. Smaller operations using draglines, small shovels, large scrapers and the like for overburden removal also set a lively pace in development of new properties and installation of larger or more efficient equipment.

Small-stripper activity was particularly notable in Ohio, Pennsylvania, West Virginia and other States outside of the big-stripper stronghold in the Middle West and Southwest. The trend toward 2- to 3-cu.yd. shovels with longer booms and handles and more powerful engines was especially marked at small strip mines in eastern Ohio, the northern West Virginia Panhandle and western Pennsylvania. Manitowoc equipment employed by the Elba Coal Mining Co., Corsica, Pa., and the new Bucyrus-Erie 54-B shovel with 2-yd. dipper and 207-hp. diesel engine, utilizing the principles of the 33-yd. 950-B units (cylindrical sticks, twin-rope crowd, etc.) used by the Weirton Construction Co., Colliers, W. Va., are cases in point. Except for smaller units, internal-combustion power and the use of end-dump trucks, many small operations now differ little from the larger in equipment and practices.

Small operators in other fields were equally active in improving facilities. A typical example is the Middle River Coal Co., Fulton, Mo., which laid up a 3-yd. steam shovel and installed a No. 620 Page dragline with 5-yd. bucket. This dragline moves as much overburden in one shift as the steamer did in about four. The Marriott-Reed Coal Co., Columbia, Mo., started in 1936 with a 3-yd. dragline, replacing this with a 5-yd. machine in 1937 and starting erection of a No. 625 Page diesel and diesel-electric dragline with 140-ft. boom and 7-yd. bucket (*Coal Age*, December, 1940, p. 67) late last year.

New large operations in 1940 included the No. 18 mine, Pittsburg & Midway Coal Mining Co., near West Mineral, Kan. This replaced the No. 17 mine, and the Bucyrus-Erie 750-B shovel with 24-yd. dipper was dismantled, moved and reerected at the new operation, engaged in recovery of the Pioneer, or "Limestone," seam, low in ash and sulphur and high in heat but ranging from only 16 to 18 in. in thickness. Three new haulage units, powered by butane, were purchased. These consist of Dart tractors and 40-ton United Iron Works semi-trailers with self-clearing bottom-dumping doors. The coal is dumped into a small hopper which feeds a 54-in. McNally-Pittsburg double-roll crusher for reducing it to a top size of 12 to 14 in. prior to transportation in standard-gage railroad cars to the central cleaning plant.

Diesel Draglines Used

Iowa developments included opening of the Fosterdale mine, National Coal Co., recovering the 5½-ft. Lower Cherokee seam. Multiple-pit mining is practiced, with stripping by two Page No. 220 diesel draglines with 90-ft. booms and 3-yd. buckets working in tandem from the highwall (*Coal Age*, January, 1941, p. 50). Overburden—half shale and half clay—averages 30 ft. Coal is loaded with a 33-B diesel shovel with 1½-yd. dipper.

Two-bench mining to eliminate a parting, or divider, was practiced by the Binkley Mining Co. of Missouri at its Macon (Mo.) mine. The divider, 1 ft. of slate and pyrites, separates the Bevier seam into a 2- to 2½-ft. top bench and an 8- to 12-in. lower bench. An 85-B shovel (5-yd. dipper) loads the top bench into trucks on the day shift. At night, this shovel strips and spoils the divider and digs up the bottom bench, piling it along the unmined coal berm. Then on the next day shift, while the 85-B again is loading top coal, a new 50-B unit with 1¾-yd. dipper loads the piled bottom-bench coal (January, 1941, issue of *Coal Age*, p. 43).

Illinois, in addition to new strippers, also offered examples of additions to handle thicker overburden. New installations included a second 950-B shovel (108-ft. boom, 70-ft. handle and 30-yd. dipper) at the Cuba No. 9 mine, United Electric Coal Cos. An 85-B machine equipped as a dragline will be used to open the pit and then will be converted to a 5-yd. loading shovel.

An addition to Middle-Western tandem operations was the Delta mine, Delta Coal Mining Co., Carrier Mills, Ill., which, in moving to a new field, installed a Marion 5320 dragline with 150-ft. boom and 10-yd. Page bucket to assist the original 5321 shovel with 12½-yd. dipper. The Little John Coal Co., Victoria, Ill., started erection of a Bucyrus-Monighan walking dragline (duplicating a Maumee unit described below) to assist its 950-B shovel (32-yd. dipper).

Developments in Indiana included bringing the new mine of the Tecumseh Coal Corporation into operation. Equipment includes the first of the Marion "knee-action" stripping shovels. This 5561 machine with

35-yd. dipper is supplemented by a 7½-yd. 4121 knee-action loading shovel. Transportation is handled by Mack tractors pulling 50-ton semi-trailers (Garwood bodies and Fruehauf running gear). Sullivan "Stripborers" drill the overburden, which is shot with liquid oxygen brought in by tank trucks.

Robin Hood No. 3 mine was opened by the Sherwood-Templeton Coal Co. in 1940, equipment including a 550-B stripping shovel with 95-ft. boom, 70-ft. handle with stop at 61½ ft. and 20-yd. dipper and an 85-B loader with 5-yd. dipper. The Blackfoot Land Corporation also installed near Coe, Ind., a 550-B stripper with 95-ft. boom, 56½-ft. handle and 21-yd. dipper.

215-Ft. Boom on Dragline

Acquired for possible special work later on, although now engaged in helping the stripping shovel, a new Bucyrus-Monighan 15-W walking dragline with 215-ft. boom and 12-yd. bucket was installed at the Linton No. 23 mine, Maumee Collieries Co. A similar machine, as noted above, was purchased by the Little John Coal Co. Tub diameter is 36 ft. Walking shoes have an area of 614 sq.ft. An auxiliary fulcrum structure facilitates changing boom position. The drag-rope outlet is raised to keep the rope out of the bank and reduce wear. Controls are in a cab on top of the house to give the operator a broader view. Electric equipment (General Electric Co.) includes a 650-hp. synchronous motor-generator set. The hoist motor is rated at 187½ hp. Two 125-hp. swing motors provide quick acceleration and a fast swing. The Maumee and Little John units are reported to be the largest draglines in the United States. Even longer booms are contemplated to permit tandem operation with the dragline on the high wall in heavy overburden.

Draglines perform the entire stripping job at Big Bend Collieries, Inc., in the Indiana Brazil Block field. Following purchase of the property from the Big Bend Coal & Clay Co., the original steam shovel was replaced in August, 1939, by a diesel-powered 5-yd. Bucyrus-Monighan walking dragline with 120-ft. boom. Satisfactory performance resulted in a decision to acquire another diesel unit with 120-ft. boom to equip a second mine, and later in sale of the first machine and its replacement by a 10-yd. electric walker with 170-ft. boom late in 1940. Approximately 9 miles of new transmission line was built to the transformer station near the pit where this machine is in service. The two draglines give the company a maximum producing capacity of about 30,000 tons of Brazil Block coal per month.

Activity in new and more efficient, auxiliary equipment matched that in major excavating units. Improved bulldozer units were adopted at many mines, while the accompanying tractors almost all were fitted with diesel engines. Several companies also adopted lighter rubber-tired tractors, such as the Allis-Chalmers unit at the Linton No. 23 mine, for bulldozing in front of strippers, etc., thus saving in both first and operating costs. Several organizations, such as Truax-Traer Coal Co., continued to benefit from the use of large tractor-powered scrapers in box-cutting, drainage work, road-building, knocking off overburden peaks and similar tasks. Truax-Traer also continued the use of power-driven brooms for cleaning the coal at both Burning Star and St. David mines.

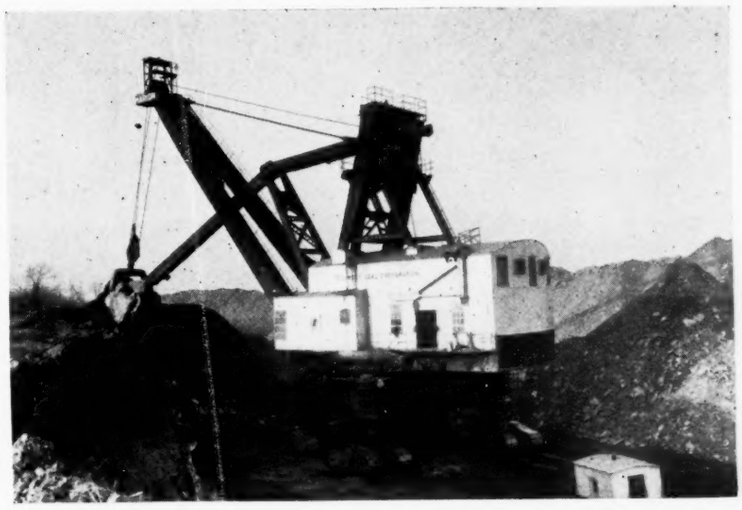
Sidewall units for drilling overburden made additional gains in 1940, although several companies still found vertical holes best suited to their conditions. Vertical-auger use was continued at Sinclair mines in Illinois, western Kentucky and elsewhere. The United Electric Coal Cos. started installation of Bucyrus-Armstrong 42-T blast-hole machines at the Fidelity No. 11 mine, Duquoin, Ill. Four of these machines, with their more powerful equipment and higher drilling speed, will replace six old Armstrong units.

With tandem stripping units (385-B shovel with 12-yd. dipper and 2-W dragline with 75-ft. boom and 2½-yd. bucket, which handles about 15 to 18 ft. of the 40- to 45-ft. overburden) powder consumption is reduced at the Millstadt No. 1 mine, Midwest-Radiant Corporation, Millstadt, Ill., by shooting after the dragline has completed its cut. Drilling is done by a rubber-tired sidewall unit, which puts in 4-in. holes about 50 ft. deep on 20-ft. centers. Loading of the holes depends upon the thickness of the limestone, with about 60 lb. of dynamite or gelatin for a 10- to 12-ft. ledge. Shooting after the dragline has passed saves about 15 lb. of powder per hole.

Ordinarily, a layer of black slate 6 in. to 3 ft. thick lies between the coal and the limestone. In a short section of the pit, however, the rock comes down on the coal. Here 2½-in. vertical holes about 20 ft. apart are drilled by a wagon drill after the dragline has passed.

Oil-well-type rotary drills with Hughes and Reed bits were adopted by the Pyramid Coal Corporation, Pinckneyville, Ill., following tests of an initial unit constructed according to the management's ideas. These Sullivan Model 46 units, with masts which may be lowered for long moves, are mounted on caterpillars and weigh 39,000 lb. In the first six months of 1940, these drills averaged 5⅓ holes, or 210 ft., per shift, compared with 1⅓ holes, or 59 ft., per shift with churn drills in the first six months of 1939. The holes contained an average of 8 to 10 ft. of hard limestone.

Binkley also continued its hydraulicking work at the Bobolink mine, Seeleyville, Ind., where it pioneered in



This 35-yd. "knee-action" shovel handles stripping at Tecumseh.

September, 1939 (*Coal Age*, November, 1940, p. 40), to knock off overburden peaks near a boundary line and thus help out the stripping unit. In the first half of 1940 average movement was 9.65 cu. yd. of overburden per minute of operating time. This overburden was pumped entirely away to settling ponds in old spoil banks.

Automotive transportation developments included new users, increases in size of units and a growth in diesel power. Tiger mine, Hume-Sinclair Coal Mining Co., led in size of equipment with three 75- to 80-ton semi-trailers built in the Tiger shops of alloy steel and pulled by Dart butane tractors. But while the Tiger units still are in a class to themselves, steady capacity increases were reflected in installation of a number of 40- and 50-ton semi-trailers in 1940, including the Tecumseh and Pittsburg & Midway equipment previously noted.

A combination haulage system for one pit at Fidelity No. 11 mine was installed late in 1940. Seven Autocar tractors (Cummins diesel engines) will pull 25-ton Garwood side-dumping semi-trailers to a ramp at the end of the pit, over which the coal will be dumped into 40-ton standard-gage cars for the final leg to the preparation plant.

Longer hauls and increased output were responsible for several other additions to and revisions in equipment and motive power. Truax-Traer continued to add to fleets at Burning Star mine, Elkville, and the Red Ember mines, St. David and Fiatt, Ill. Thirty-six units, each consisting of a Euclid tractor and 22-ton semi-trailer, now are in service. New units in 1940 were powered by Cummins diesel engines and the last three were equipped with hydraulic couplings which, "from our experience to date, have proved most satisfactory and seem to have been the biggest improvement we have made in our truck-haulage equipment for some time."

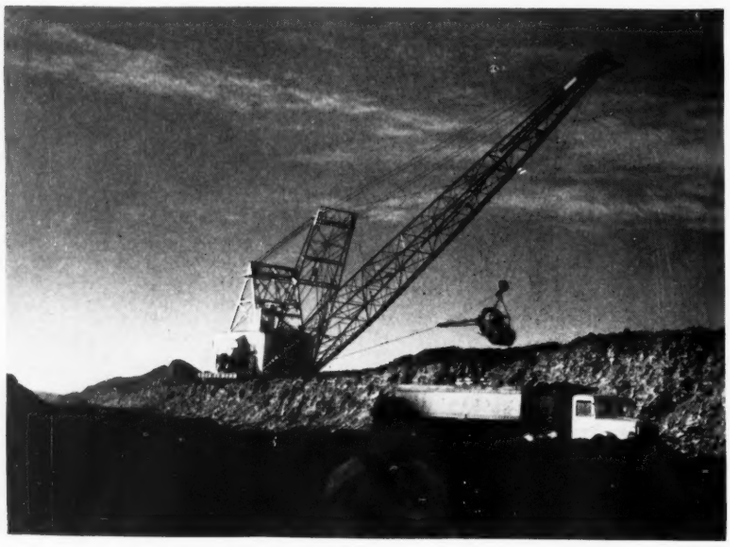
Trailer Size Decreased

Movement of the pit, which increased the average one-way haul to 4 miles, was responsible for a change at the Streamline mine, Southwestern Illinois Coal Corporation, Percy, Ill., which included taking the 16-ton bodies off the original Mack trucks and converting them into tractors to pull 32-ton side-dumping semi-trailers (Garwood high-tensile-steel bodies and Fruehauf running gear). Gasoline engines were replaced by 200-hp. Cummins supercharged diesel units, and auxiliary transmissions were installed to bring the top speed up to 40 m.p.h. On test, the first diesel unit averaged 42 gal. of fuel per day (100 to 110 miles) against 75 to 90 gal. of fuel by the gasoline engines. The diesel unit also was able to travel up grades in a 1 to 1½ higher gear. "These changes in truck design and operating these trucks over a road constructed of crushed rock with an oil top made it possible to maintain previous production in spite of increased length of haul."

Other companies adding to equipment included the Bankston Creek Collieries Co. (affiliated with the Sahara Coal Co.), Harrisburg, Ill., which equipped one of its latest units with a Cummins diesel engine. The Autocar tractors at Bankston Creek each pull one 20-ton semi- and a 20-ton full Austin-Western trail cars. Diesel power also was specified for a new Walter four-wheel-drive tractor pulling an A-W trail car at a Maumee property in Indiana. Delta mine, Delta Coal Mining Co., Carrier Mills, Ill., tackled the problem of increasing capacity by adding 6-in. sideboards to the Sanford-Day drop-bottom semi-trailers used, increasing capacity from 15 to 18 tons. Original 125-hp. gasoline engines were replaced with new 175-hp. Waukesha units, also using gasoline.

Increased attention to road construction was a byproduct of automotive-transportation developments in 1940. At Millstadt No. 1, as an example, good drainage is considered as important as a good surface. Haulage at this mine is handled by Dart tractors (Hercules HXE gasoline engines) pulling 32-cu.yd. United Iron Works bottom-dumping semi-trailers holding 25 to 30 tons of coal. The soil is a yellow clay that becomes plastic and unstable with only a slight percentage of moisture. Roads are built 30 ft. wide, shoulder to shoulder, with the ditches at least 2 ft. deep measured from shoulder level. Fills were made with a dragline, and the dirt was leveled by a bulldozer, which rolled it down into a dense base. Five inches of crushed stone then was applied and the roads put in service about six months. The surface was kept bladed level and more stone was added as soft spots showed up. In one cut, a spring made the road soft and spongy and this condition was corrected by putting in tile drains.

At the end of the first six months, a second layer of stone was applied along with coal tar (about 2 gal. per square yard) made in processing coal for the production of "Solarite" smokeless fuel in the company's carbonizing plant (*Coal Age*, May, 1940, p. 33). Stone and tar were thoroughly mixed and bladed out to cover the surface, after which the trucks rolled it down. Then the top was dressed with another application of coal tar (about ½ gal. per square yard) and rock chips were spread evenly over it. Running over it a few days resulted in a dense, hard surface "which is holding up fine to date." The coal tar contains about 60 per cent light oils and penetrates to a depth of about 10 in., thoroughly waterproofing the surface.



With a 12-yd. bucket and 215-ft. boom, this new electric walking dragline helps in stripping at Linton No. 23 mine.

ANTHRACITE INDUSTRY

Makes Progress in Stabilization; Control Program Improves Financial Status

By LOUIS C. MADEIRA III
Executive Director, Anthracite Institute

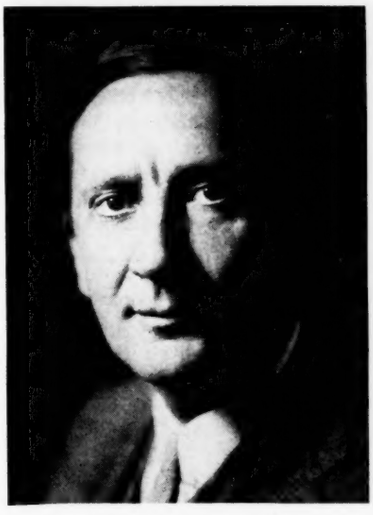
THE PENNSYLVANIA anthracite industry enters 1941 with much of encouraging nature based upon the factors which developed in 1940, giving renewed promise for better times in the industry. With more than 90 per cent of the legitimate anthracite industry operating under a voluntary production control program promulgated by Governor Arthur H. James of Pennsylvania in cooperation with the United Mine Workers and the producers, the industry has succeeded in achieving a reasonable balance between production and demand. One pleasing result of the operation of this plan has been the spreading of work and a degree of alleviation of the unemployment situation in the counties of northeastern Pennsylvania in which reside one-eighth of the total population of the Commonwealth.

Virtually all units of the industry operating under Governor James' anthracite program find themselves in better financial condition than at the beginning of last year. The emergency program was placed in active operation in the last week of January, 1940.

Railroad shipments of anthracite last year were less than 2 per cent below those for 1939. Although final figures will not be available for several weeks, it would appear that, based on the best information the institute has been able to obtain regarding commercial production of anthracite for the calendar year 1940, there should be little difference as compared with the tonnage for 1939. While railroad shipments of anthracite decreased in 1940, the increasing trend in over-the-road trucking of anthracite would indicate that the tonnage lost by the railroads has been principally taken up by trucks.

If the industry continues to cooperate under the anthracite program in the same spirit thus far manifested, it will be definitely on the broad road to better times and in a position to consolidate gains and takes such effective steps as are necessary to increase sales volume. An encouraging factor is the reduction in the number of cases of producing-company failures during 1940. A better understanding and relationship among all factors interested in the anthracite industry is another most encouraging sign.

Regrettable as is the European War situation and its effect on the economy of the Dominion of Canada and of her mother country, an improved demand in Canada for Pennsylvania anthracite, which had its inception in 1938, continued into 1940 at a most satisfactory rate. However, a trend which has been observed in recent months would indicate that the increases in shipments of Pennsylvania anthracite into Canada are not as pronounced as were those in the earlier months of 1940.



Louis C. Madeira III

Imports of solid fuels into the United States decreased substantially during 1940, but, more recently, indications point to a certain resumption of imports originating in the British Isles. Recent months also have witnessed an increase in the shipment of British coke into the New England and Middle Atlantic States. While a reduced rate of imported solid fuels was noted during 1940, a most satisfactory increase in shipments of Pennsylvania anthracite was made into the New England market. Although the European war is responsible for the fluctuations in the quantities of foreign fuels entering New England, considerable credit is due the efforts of the New England coal trade in promoting the use of American anthracite in preference to foreign substitutes.

The situation with regard to imported fuel oil, however, is far from satisfactory. In spite of an original forceful but fruitless representation during 1938 by the anthracite industry and others before the Committee for Reciprocity Information at Washington in connection with the Venezuelan trade agreement, a flood of low-cost foreign-labor-produced oil continues with only 0.5c. per gallon duty imposed on Venezuelan oil. This agreement is to remain in force until Dec. 15, 1942. Despite the fact that Venezuelan oil entering the United States may not in one year exceed 5 per cent of the quantity of oil refined in the United States in the preceding year, Venezuelan oil entering the United States this year will amount to at least 60,000,000 bbl. This quantity would account for between 12,000,000 and 16,000,000 tons of Ameri-

can produced coal being replaced by the low-priced foreign oil.

The approach to the "bootleg" coal problem in the anthracite region has, in some respects, improved during 1940, in spite of the fact that actual output produced represents an increase over 1939 and is estimated as upward of 4,000,000 tons. Any concrete improvement up to the end of 1940 can be traced solely to the legislative or law-enforcement barriers which have been set up by States bordering on Pennsylvania—not to any official or other executive activities within the Commonwealth. Early in 1940, New Jersey's so-called "Certificate of Origin Law"—enacted for the protection of residents in that State against stolen goods and further for the well-being of legitimate tax-paying equipped coal merchants located in New Jersey—was declared unconstitutional by a Federal District Court pursuant to an action instituted by coal trucking interests and itinerant dealers. A petition which has been prepared and expected to be presented soon to the Supreme Court of the United States by the Attorney General of New Jersey seeks to have the decision reversed and the law upheld.

Seek Bootleg Solution

In a sincere effort to solve this social and industrial problem, an actively working committee composed equally of anthracite producing representatives and officials of the United Mine Workers developed certain recommendations which the committee feels will prove efficacious in at least alleviating and possibly eliminating this serious problem. Up to the end of the year, however, the Governor of Pennsylvania had not taken steps necessary to bring into fruition the desires of the committee.

One of the happier sides of the anthracite situation is the reduction in the number of mining fatalities as compared with the previous year and the excellent cooperation existing between men and management in the industry. The efforts of the officials of the United Mine Workers in reducing unnecessary stoppages of work also is most gratifying.

Mechanization in the anthracite industry has continued to increase in scope and at least one large operation was able, through mechanization, to employ nearly a thousand men in the active mining of coal measures which would not have been recovered had the mine not been mechanized. Although the Pennsylvania Department of Mines has not yet released figures concerning employment for 1940 as compared with 1939, there is every reason to believe that no reduction in employment has occurred in the legitimate anthracite industry in the last year.

Freight tariffs affecting anthracite movements were not subject to any major changes during 1940, although there were the usual minor adjustments and equalizations. The so-called motor-compelled rates established originally to compete with highway-borne coal traffic have been extended until June 21, 1941.

During 1940 certain anthracite mining companies, representing a large percentage of the productive capacity of the industry, joined with the Attorney General of Pennsylvania in a proposal to the anthracite-originating railroads that anthracite tariffs on steam sizes be reduced in the existing motor-compelled-rate area, and that the influence of these rates on domestic and steam sizes be expanded to apply more generally to eastern and central New York State. The producers and the Commonwealth of Pennsylvania were met by refusals on the part of the carriers to the proposed general reduction in rates and the increased scope of the reduced rate structure. The interested applicant parties therefore have prepared a petition which will be presented to the Interstate Commerce Commission by the producers with the cooperation of the Attorney General. In acting in this matter, the Attorney General complied with the mandatory statute enacted in 1939 which appropriated $50,000 to cover the expense of any action deemed necessary to prevent increases and secure reductions of anthracite rail-borne tariffs.

The case, commonly known as "the New York Tidewater Case," in which briefs were filed during 1939, is still pending and a report and order from the Interstate Commerce Commission are still being awaited, rounding out more than 3½ years of litigation since the case was instigated by a group of anthracite producing organizations in the year 1937.

Late last year, the anthracite industry was placed in jeopardy by railroads serving the St. Louis and Chicago areas publishing drastically reduced tariffs from those areas to intermediate points as far as the eastern seaboard. These reductions were as high as 43½ per cent and applied specifically to crude petroleum, fuel oil and other oil commodities. The Anthracite Institute was joined in opposition to the proposed reduced rates by bituminous coal-producing interests, coal traffic bureaus and a substantial list of oil producers and refiners. A week after the institute had filed a petition for investigation and suspension with the Interstate Commerce Commission, the railroads withdrew the new tariffs, which were to have become effective on several dates up to early January, 1941.

Trucking of anthracite from mines to markets continues on an increasing basis which has been sustained for several years. This traffic is estimated as representing approximately 8,000,000 tons, half of which is stolen or illegitimately produced coal. A substantial percentage of this stolen coal movement by truck is disposed of within the Commonwealth of Pennsylvania.

Pipe Lines Threaten Coal

Pipe lines for the transportation of oil and natural gas, which represent a continuing and increasing threat to the life of the anthracite industry, during 1940 became more serious in their current and potential effect on the industry. Efforts to displace anthracite by natural gas in southeastern Pennsylvania were opposed by the Anthracite Institute and other affected groups, and the gas company withdrew its application. A larger project came into being during 1940 through the application of the Reserve Gas Pipe Line Co. of Dallas, Texas, filed with the Federal Power Commission seeking a certificate of public necessity and convenience to construct a 1,500-mile pipe line from Texas to serve Philadelphia, the State of New Jersey, and the Metropolitan New York area with natural gas to gas-distribution companies for their own use and for resale by them for ultimate public consumption. This territory represents the very heart of the anthracite market. The application is being opposed by the industry on many counts, including national defense, and concurrently by nationwide bituminous coal, byproduct coke interests, the railroads and by the railroad, mine, teamster, stevedore and other unions.

Research of earlier years proved of benefit to the anthracite industry during 1940 through increased sales of "Anthrafilt." This specially selected and prepared anthracite distributed by the Anthracite Equipment Corporation and used as an improved filter medium for city waterworks in place of sand, and in the power-plant-water conditioning and chemical field, con-

tinues to expand in distribution geographically. Anthrafilt has, in fact, in recent years become an accepted product in several fields of application. Anthrafilt has a valuable function in the sewage-disposal field which holds promise of a considerable source of future business. Attractive displays of this material have been designed and permanent displays are being donated to filter engineering firms, engineering schools, and the larger municipal waterworks plants, where effective educational results have been obtained.

A cooperative research program, financially supported equally by the Commonwealth of Pennsylvania and the anthracite industry, at Pennsylvania State College, on which actual work was started Oct. 15, 1939, will continue until May 31, 1941, when appropriations under the Miller bill, which made this activity possible, come to a statutory end. Certain valuable fundamental laboratory and field testing procedure has been developed which will prove of lasting value in any future anthracite research work. A series of plant scale tests in the field of water-gas generation was made last year in order to develop new standards of gas-generator design and operating practice. The findings after more than a year of actual work appear favorable as a means of expanding the sales of the larger anthracite sizes.

A second phase of the research activity is concerned with the development of anthracite as a commercial carbon through activation of the carbon content of anthracite as the material for the adsorption of unwanted or dangerous gases, odors, tastes and colors. Anthracite may well be found capable of taking its place in the second line of national defense by allowing the release of more readily activated carbons which have a greater capacity for adsorption in more exacting military (for use in gas masks) and industrial applications. All of the many types of Pennsylvania anthracite show adaptable characteristics to meet modern requirements of either or both of the gas-engineering and the commercial carbon fields; thus, benefit may be expected to accrue to the entire anthracite industry. There are indications that an attempt will be made in the 1941 Assembly of the Commonwealth of Pennsylvania for an extension and possible enlargement of this constructive cooperative research program.

The St. Lawrence waterway project sponsored by the Roosevelt administration over a period of years became very active during 1940 as a threat to the anthracite, bituminous coal, railroad and other industries and their employees. The Anthracite Institute continued its opposition toward this entire project because of the ill effects of this project on itself, its allied industries and the national economy. The Anthracite Institute also has continued its opposition to similar navigational and hydro-electric projects, notably in the Delaware and the Connecticut River valleys.

MECHANICAL LOADING

And Cleaning Capacity Up in 1940; Conveyor Equipment Hits New High in Sales

By W. H. YOUNG, R. L. ANDERSON, G. A. LAMB and F. M. SHORE*

CAPACITIES for mechanical loading and cleaning of coal were substantially increased by the sales of new equipment in 1940. The total production of mechanically cleaned bituminous coal in 1938, the latest year for which data are available, was 57,998,341 net tons at the mines and 5,456,247 tons at central washeries, a total of 63,454,588 tons.

Production of mechanically loaded coal in 1938 (the latest year for which final figures are available) was 85,092,836 tons at underground bituminous mines and 10,151,669 at underground anthracite mines, or a total of 95,244,505 net tons. The estimated capacity of mechanical loading equipment introduced in bituminous coal mines was 11.6 per cent greater in 1940 than in 1939. The total number of units sold to bituminous mines increased from 1,407 to 1,845 during the same period, and the grand total for bituminous and anthracite increased from 1,631 to 2,037, or 24.9 per cent.

Data on mechanical cleaning of bituminous coal are compiled from reports furnished by manufacturers of mechanical cleaning equipment supplemented with data from various trade journals. Figures on mechanical loading are based upon reports supplied by all known manufacturers of mechanical loading machinery for underground use in coal mines. The number of manufacturers reporting in

* Messrs. Young, Anderson, and Lamb are members of the Economics Branch, Bituminous Coal Division, U. S. Department of the Interior. Mr. Shore is acting chief engineer, Coal Economics Division, U. S. Bureau of Mines.

Printed with permission of the director of the Bureau of Mines.

Table I—Units of Mechanized Loading Equipment Sold to Bituminous and Anthracite Mines, as Reported by Manufacturers, 1933 to 1940, Inclusive [1]

	1933	1934	1935	1936	1937	1938	1939	1940	Per Cent Increase (+) or Decrease (−) 1940 over 1939
Mobile loaders	41	55	115	344	292	241	292	233	−20.2
Scrapers [2]	65	34	22	28	29	10	26	39	+50.0
Conveyors [3]	396	610	681	994	1,095	990	1,311	1,762	+34.4
Pit-car loaders	18	26	28	11	32	139	2	3	+50.0

[1] The figures for 1933 to 1936 included reports from 28 manufacturers. In 1937 one manufacturer indicated that he was no longer producing this type of equipment and accordingly was dropped from the active list; however, at the same time another manufacturer was added to the list, and the number of reporting firms remained at 28. In 1938 one manufacturer of material-handling machinery began the production of underground loading equipment and in 1939 two new manufacturers entered the field, increasing the total number reporting to 31. Figures for 1940 include reports from 32 manufacturers.

[2] Reported as scrapers or scraper haulers and hoists.

[3] Includes hand-loaded conveyors and those equipped with duckbills and other self-loading heads. As sales of both loading heads and shaker conveyors are counted, the figures involve a certain measure of overlap, which cannot be determined accurately. It should also be noted that a small number of conveyors sold in recent years, particularly in 1936 to 1938, were for use in conjunction with mobile loading machines.

1939 was 31. One manufacturer which reported that it had gone out of business in 1939 was dropped from the list, and three were added, making a total of 33 firms canvassed for the year 1940. (Data for one manufacturer were not received in time to be included.)

Reports on sales of mechanical cleaning equipment show that installations were made in 13 States at bituminous mines during 1940. Although these sales were made during 1940, some of the plants will not be completed until early in 1941. The total capacity of cleaning plants sold in 1940 is estimated at 12,000 net tons of cleaned coal per hour. Installations at mines not previously having cleaning plants accounted for 60 per cent of the total capacity, and additional equipment at mines with previous cleaning equipment accounted for the other 40 per cent. About 90 per cent of the total capacity of the 1940 sales was reported from wet-washing plants, and the other 10 per cent from pneumatic cleaning plants.

The largest number of installations was reported by West Virginia, with Indiana, Illinois, Pennsylvania, Alabama and Ohio following in the order named. In terms of capacity, Indiana is the greatest, with West Virginia, Illinois, Ohio, Pennsylvania and Alabama following.

There were 233 mobile loaders sold during 1940, as compared with 292 in 1939, a decrease of 20.2 per cent. This is the lowest number of annual sales recorded since 1935, when only 115 units were sold. The peak year of sales for mobile loaders was 1936, when 344 sales were made.

Sales of scrapers increased from 26 in 1939 to 39 in 1940, or 50 per cent. This is the highest record of sales for scrapers since 1933, when 65 were recorded.

Conveyor sales registed an all-time high in 1940, with a record of 1,762 sales, an increase of 34.4 per cent over 1939. The conveyor unit sales figures include both hand-loaded types and those equipped with duckbills or other self-loading heads. In counting sales of duckbills and shaker conveyors on which they are used, there is a certain overlapping of sales, the extent of which cannot be accurately determined. The number of duckbills cannot be shown separately without disclosing the figures of individual companies, but it can be said that they are finding acceptance in several new fields.

Sales of pit-car loaders increased from two in 1939 to three in 1940. Table I shows the number of units of mechanized loading equipment sold to bituminous and anthracite mines as reported by manufacturers for the years 1933 to 1940, inclusive, with per cent of increase or decrease in 1940 over the year 1939.

Shipments of mechanical loading devices were made to 18 States in 1940. Table II shows the total number of units placed in each State or region. In a few instances separate figures are not shown for each State to avoid disclosing the business of individual manufacturers. Types of equipment in approximate order of capacity are shown by letter symbols. For example, in West Virginia, 802 units of loading equipment were sold. In this aggregate of new equipment sold, conveyors (indicated by "C") furnished the largest addition to capacity, followed by mobile loading machines ("L"), scrapers ("S"), and pit-car loaders ("P"). There was a total of 1,845 units of all types shipped to bitumi-

Table II—Total Number of Units of Mechanized Loading Equipment Shipped for Use in Each State or Region in 1940

(L — Mobile loading machines; P — Pit-car loaders; S — Scrapers; C — Conveyors and duckbills)

	Number of Units of All Types Shipped in 1940	Types of Equipment in Approximate Order of Capacity in 1940
Northern Appalachian States:		
Pennsylvania	326	L.C.S.
Ohio and Michigan	206	C.L.S.
Southern Appalachian States:		
West Virginia	802	C.L.S.P.
Virginia	47	C.L.
Kentucky	152	C.L.
Alabama	70	C.L.S.
Tennessee	26	C.
Middle Western States:		
Illinois	34	L.C.P.
Indiana	29	L.C.
Trans-Mississippi States:		
Arkansas and Oklahoma	35	C.
Iowa	27	C.L.
Colorado	52	C.L.P.
New Mexico, Utah and Montana	13	L.C.
Wyoming	26	C.L.
Total bituminous	1,845	C.L.S.P.
Pennsylvania anthracite	192	C.S.
Grand total	2,037	C.L.S.P.

Table III—Sales of Mechanized Loading Equipment in 1939 and 1940 Compared With Total Number of Machines in Active Use in Preceding Years

	Number of machines in active use, as reported by mine operators [1]							Number of machines Sold as reported by manufacturers	
	1930	1931	1932	1933	1934	1935	1936	1938	1939	1940
Bituminous mines:										
Mobile loading machines	545	583	548	523	534	657	980	1,405	292	233
Scrapers	150	146	128	93	119	78	106	117	18	36
Pit-car loaders	2,876	3,428	3,112	2,453	2,288	2,098	1,851	1,392	2	3
Conveyors equipped with duckbills and other self-loading heads	140	165	159	132	157	179	234	346	[3] 1,095	[3] 1,573
Hand-loaded conveyors — number of units		[2]	[2]	525	574	670	936	1,526		
Anthracite mines (Pennsylvania):										
Mobile loading machines	384	5	11	18	14	1	504	[4]	.....	.....
Scrapers		457	479	455	517	507		545	8	3
Pit-car loaders		28	24	19	25	22		.....	.....	.....
Conveyors equipped with duckbills and other self-loading heads	421	1	17	12	13	30	1,790	[4] 1,831	[3] 216	[3] 189
Hand-loaded conveyors — number of units		547	818	940	1,338	1,563				

[1] Data for 1937 not available for bituminous mines. Minerals Yearbook 1939, page 857, shows 539 scrapers and 1,855 conveyors and pit-car loaders including a few mobile loaders in the anthracite mines for 1937.

[2] Number of units not reported in these years.

[3] Reported as face conveyors (hand-loaded), "shaker drives," and "duckbills." The figures of numbers sold in 1939 and 1940 are not exactly comparable with the number in use in 1938, because of uncertainties in defining what constitutes a conveyor and because of certain overlaps in the reporting of duckbill loading heads and shaker conveyors.

[4] Mobile loading machines included with conveyors and pit-car loaders.

nous mines and 192 to anthracite mines in 1940.

The change in demand for different types of mechanical loading equipment is shown in Table III. The number of mobile loaders in active use in 1930, as reported by mine operators, was 545. This increased to 1,405 in 1938. Sales of mobile loading units in 1939 and 1940 were 292 and 233, respectively. The sales in these two years were 37.4 per cent of the total number in use in 1938.

Scrapers in use from 1930 to 1938 decreased from 150 to 117, or 22.0 per cent, and the total sales in 1939 and 1940 were 18 and 36, respectively, or 46.2 per cent of the number in use in 1938. Pit-car loaders in use decreased from 2,876 in 1930 to 1,392 in 1938, or 51.6 per cent. Sales of pit-car loaders in 1940 continued at a very low rate, with three sales reported for the entire bituminous industry.

The first year for which data on both self-loading and hand-loading conveyors are available is 1933, when 657 machines were in use. In 1938 they had increased to 1,872. Sales in 1939 and 1940 were 1,095 and 1,573, or 42.5 per cent greater than the total number in use in 1938.

Anthracite Units Up

The change in demand for different types of mechanical loading equipment for use in anthracite mines also is shown in Table III. The total number of units of mechanized loading equipment in use at anthracite mines increased from 805 in 1930 to 2,376 in 1938. Detailed figures are shown for the years 1931 to 1935, inclusive, but certain items have had to be combined in other years to avoid disclosing individual operations. The total sales in 1939 and 1940 were 224 and 192, respectively, or 17.5 per cent of the number in use in 1938.

Table IV shows the number of mobile loaders, scrapers and conveyor units shipped into each State in 1939 and 1940, and the number of units in actual use in 1938. All of the 233 mobile loaders sold in 1940 were for use in bituminous mines. The largest number of these went to Pennsylvania, with West Virginia, Ohio and Kentucky following in the order named.

There was a total of 39 scraper units sold in 1940, 36 of which went to the bituminous mines and 3 to the anthracite. West Virginia received the greatest number of these units, with a total of 18; Alabama followed with 10; Pennsylvania bituminous, 7; Pennsylvania anthracite, 3; Ohio, 1.

The Southern Appalachian fields continued to be the largest market for conveyor units. In 1940, sales to the Southern Appalachian States of conveyors of all types including those equipped with duckbills amounted to 981, compared with 681 in 1939, an increase of 44.1 per cent. Sales of all types of conveyors in the Northern Appalachian States rose from 270 in 1939 to 407 in 1940, an increase of 50.7 per cent. The Trans-Mississippi States and the Middle Western States also showed increases in last year over 1939.

Mechanization continued to spread to new fields and new companies in 1940. Table V shows the number of bituminous coal mining companies using mobile loaders in 1938 and purchasers of this equipment in 1939 and 1940, by States. There were 218 companies using mobile loaders in 1938. Of the 104 companies buying mobile loaders in 1939, 68 had used these before, while 36 companies were installing them for the first time. In 1940, 27 new companies began using mobile loaders, and 56 bought additional equipment. West Virginia furnished the greatest number of companies purchasing mobile loaders for the first time in 1940.

Sales of self-powered rubber-tired trackless haulage units continued to advance during 1940. Installations were made in nine States in the course of the year.

Table IV—Comparison of Mobile Loaders, Scrapers and Conveyors in Actual Use in 1938, With Sales Reported in 1939 and 1940, by Regions

	Mobile Loaders			Scrapers			Conveyors[1]		
	In Use in 1938	Sales in 1939	Sales in 1940	In Use in 1938	Sales in 1939	Sales in 1940	In Use in 1938	Sales in 1939	Sales in 1940
BITUMINOUS									
Northern Appalachian States:									
Pennsylvania	164	89	94	32	1	7	476	225	225
Maryland	.....	...	...	...	..	..	.....	.....	.....
Ohio	70	17	23	...	..	1	29	45	178
Michigan	.....	...	...	...	..	..	.....	.....	4
Southern Appalachian States:									
Alabama	23	7	6	32	8	10	134	82	54
Kentucky	47	28	18	...	..	..	117	131	134
Tennessee	3	...	...	9	..	..	43	41	26
West Virginia	266	85	59	...	9	18	443	375	724
Virginia	27	8	4	...	..	..	.....	52	43
Middle Western States:									
Illinois	504	28	8	...	..	..	37	28	25
Indiana	158	12	7	...	..	..	.....	2	22
Trans-Mississippi States[2]	143	18	14	44	..	..	593	114	138
Total bituminous	1,405	292	233	117	18	36	1,872	1,095	1,573
ANTHRACITE									
Pennsylvania	[3]	...	...	545	8	3	[3]1,831	216	189
Grand total	1,405	292	233	662	26	39	3,703	1,311	1,762

[1] Includes hand-loaded conveyors and conveyors equipped with duckbills or other self-loading heads.
[2] Includes Arkansas, Colorado, Iowa, Montana, New Mexico, North Dakota, Oklahoma, Utah, Washington and Wyoming.
[3] Mobile loaders and pit-car loaders included with conveyors.

Table V—Number of Bituminous Coal Mining Companies Using Mobile Loaders in 1938 and Number of Companies Purchasing Equipment in 1939 and 1940

(Based upon records covering 86 per cent of the total sales in 1939 and 84 per cent in 1940)

		Purchasers in 1939		Purchasers in 1940	
	Users in 1938	Former Users	New Users	Former Users	New Users
Northern Appalachian States:					
Pennsylvania	27	13	7	16	6
Maryland	—	—	—	—	—
Ohio	8	3	3	2	4
Southern Appalachian States:					
West Virginia	59	21	10	15	9
Virginia	9	1	4	2	—
Kentucky	22	10	3	5	3
Tennessee	3	—	1	—	—
Alabama	8	3	1	1	2
Middle Western States:					
Illinois	35	8	1	4	—
Indiana	23	5	1	4	—
Trans-Mississippi States:					
Arkansas	1	—	—	—	—
Colorado	7	—	2	1	1
Iowa	—	—	1	—	1
Montana	5	1	—	1	1
New Mexico	2	—	—	1	—
North Dakota	—	—	—	—	—
Oklahoma	—	1	—	—	—
Utah	6	1	1	2	—
Washington	—	—	—	—	—
Wyoming	3	1	1	2	—
Total	218	68	36	56	27

BITUMINOUS MINES

Add to Plants and Equipment And Improve Practices in an Active Year

THOUGH the year just passed ended full of assurance, the earlier part of it was not such as to favor big development. Bituminous tonnage rose 15 per cent in 1940, but every evidence indicates that the present year's record should greatly exceed that attained in the past year.

With the introduction of mechanical loading, the industry steadily revises what might be appropriately dubbed the "service of supply"—those various items by the help of which the machines at the face are enabled to operate continuously. Efficient mechanization is impossible without synchronization and efficiency in all parts of the mine.

One of the leading trends in such service in 1940 has been toward faster main-line service. In many ways, the mines are ideal places for speed in transit, just as are city subways. With mine track resting on a solid bottom without fills, usually with an absence of floods to wash away the track, with freedom from fog or rains, with no straying animals to menace travel, with few curves except on leaving the main entry, with trips always running at the same speed at any given part of the track and with equipment not so high as to become unbalanced in passing over a low point or curve, and not so heavy as to tear up or break the rail, there would seem to be fewer reasons for slow cautionary underground trips than for slow railroad trains.

Yet, because mine distances were short and rail distances were long, railroad trains always have been many times as speedy as mine trips. Distances in mines today compel speed, and it is no wonder that in many mines, where gradients are favorable, cars travel at 30 to 35 miles per hour, at least for short distances.

Only five restrictive considerations exist to reduce speed: the risk of a pile of fallen rock lying on the track, narrow gages, short wheelbases, the air resistances of the trip in a narrow roughly hewn tunnel and failure to provide strength in locomotive windings to permit of such speeds. With a straight track, good lights, good brakes and an active motorman, the first difficulty is negligible, especially if the roof is frequently inspected and well supported. The next two are important only with curves, and the fourth is not of even economic importance. Manufacturers have now removed the fifth.

Hydraulic braking for locomotives and cars is being introduced; track is being given a permanence in mines that railroad track cannot duplicate; lighting and signaling are being improved; the bodies of locomotives and cars are being stiffened; car couplings are being made of adequate strength; vertical curves are being eased; so speed in transit is no longer perilous.

As evidence of the improved car construction permitting such speeds, the Republic Steel Co. has 300 five-ton cars in operation at Crescent No. 2, leased from the Pittsburgh Coal Co., all with Ohio Brass automatic couplings; 298 with spring draft and two, most significantly, with rubber pads in the draft rigging, absorbing 50,000 lb. on compression and 25,000 lb. during draft for ½-in. compression of the rubber (*Coal Age*, June, 1940, p. 37). Though an innovation in this country, rubber pads have been used for some time in Great Britain for this purpose.

With larger cars, all the "gadgets" that railroad cars have incorporated —hydraulic brakes, automatic couplers, spring draft, four-wheel trucks —have come and come to stay. Among the many installations of the past year have been the replacement, by the Pittsburgh Coal Co., of 2.4-ton cars with 500 5½-ton stub-axle cars

Willow Grove mine of Hanna Coal Co., where spray system is installed.

and of several open-type gathering locomotives with those of flameproof type.

In like manner 220 steel mine cars have been installed by the Koppers Coal Co.; 100 steel mine cars by the Lake Superior Coal Co., at Superior, W. Va.; 75 mine cars at the Frederick mine of the Colorado Fuel & Iron Corporation, Valdez, Colo.; 50 all-steel mine cars at the Bradford mine of the Alabama By-Products Corporation, the last as part of a general policy of gradually replacing the old wooden cars with steel equipment, and 25 steel mine cars of new design at the mines of the Oliver Coal Co., Somerset, Colo. These last are end-dump units holding, when machine loaded, about 1,500 lb. more coal than the old wooden cars, though they have the same over-all dimensions. Their capacity loaded by machine is 6,200 lb.

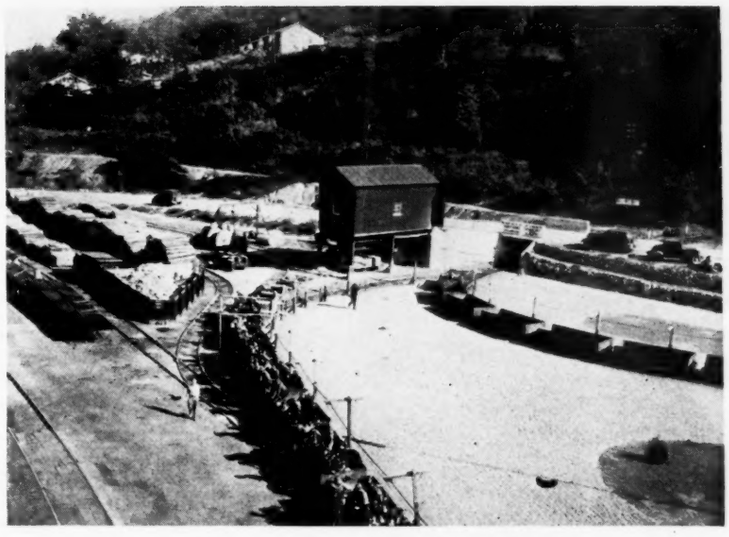
At the Dun Glen No. 11 mine, the Hanna Coal Co. put in operation a large number of Differential large-capacity 8-wheel rotary-dump steel cars, which greatly reduced operating costs.

Locomotives have been added by several companies, among which are two by the Premar Coal Co., Tunnelton, W. Va.; two by the Colorado Fuel & Iron Corporation at its Frederick mine, and one 6-ton locomotive by the Pennsylvania Edison Co. at Altoona, Pa. To perfect its 1,000-ft. main-slope track, the Oliver Coal Co. removed all the short, steep gradients in the roadbed, some running up to 7 per cent, thus making an even 3½-per-cent track which, when lined and ballasted with cinders, makes a most reliable road.

More Paint Mine Roof

The Southwest continues to use paint as a means of preserving the mine roof in its intake roadways, the Mullen Coal Co., McAlester, Okla., being a case in point. It has adopted as a practice the protection of its intake airways with Ebonal paint and finds the treatment very satisfactory. Among the believers in its value for the protection of mine roofs subject to atmospheric degeneration is the McAlester Fuel Co., which regards it as the best and cheapest way of avoiding such roof deterioration.

To reduce the danger of explosions, the Pittsburgh Coal Co. forehandedly has replaced several short-wall open-type cutting machines with units of permissible type. The Premar Coal Co., Tunnelton, W. Va., added



Mine trip leaving Willow Grove mine.

in the past year three more cutting machines and the Penelec mine of the Pennsylvania Electric Co., Johnstown, Pa., one such unit.

A four-mile system to drain Mabscott, Sprague and Skelton mines and 65 per cent of Cranberry mine, all in Raleigh County, West Virginia, has been practically completed by the New River Co., after being under construction for several years. It consists of a series of ditches and connections leading to a shaft measuring 8½x9 ft. within timbers and located a mile from Cranberry, W. Va.

Three deep-well turbine 5,000-g.p.m. 450-hp. 2,300-volt A. D. Cooke, Inc., pumps were scheduled for delivery for the shaft before Jan. 1. Motors for these plants are of General Electric construction. With these new pumps, it will be possible to dispense with all of the scattered main pumps now in use in these mines and to effect an appreciable saving in pumping charges. The new system also will give better drainage.

In one large mine, the Koppers Coal Co. installed last year a large central pumping station to eliminate the use of many smaller pumping units, thus making the pumping much more economical and satisfactory. Among the drainage projects completed in 1940 has been the installation of completely automatic pumping stations by the Oliver Coal Co., of Somerset, Colo., to gather water from each entry and pump it to the main sump.

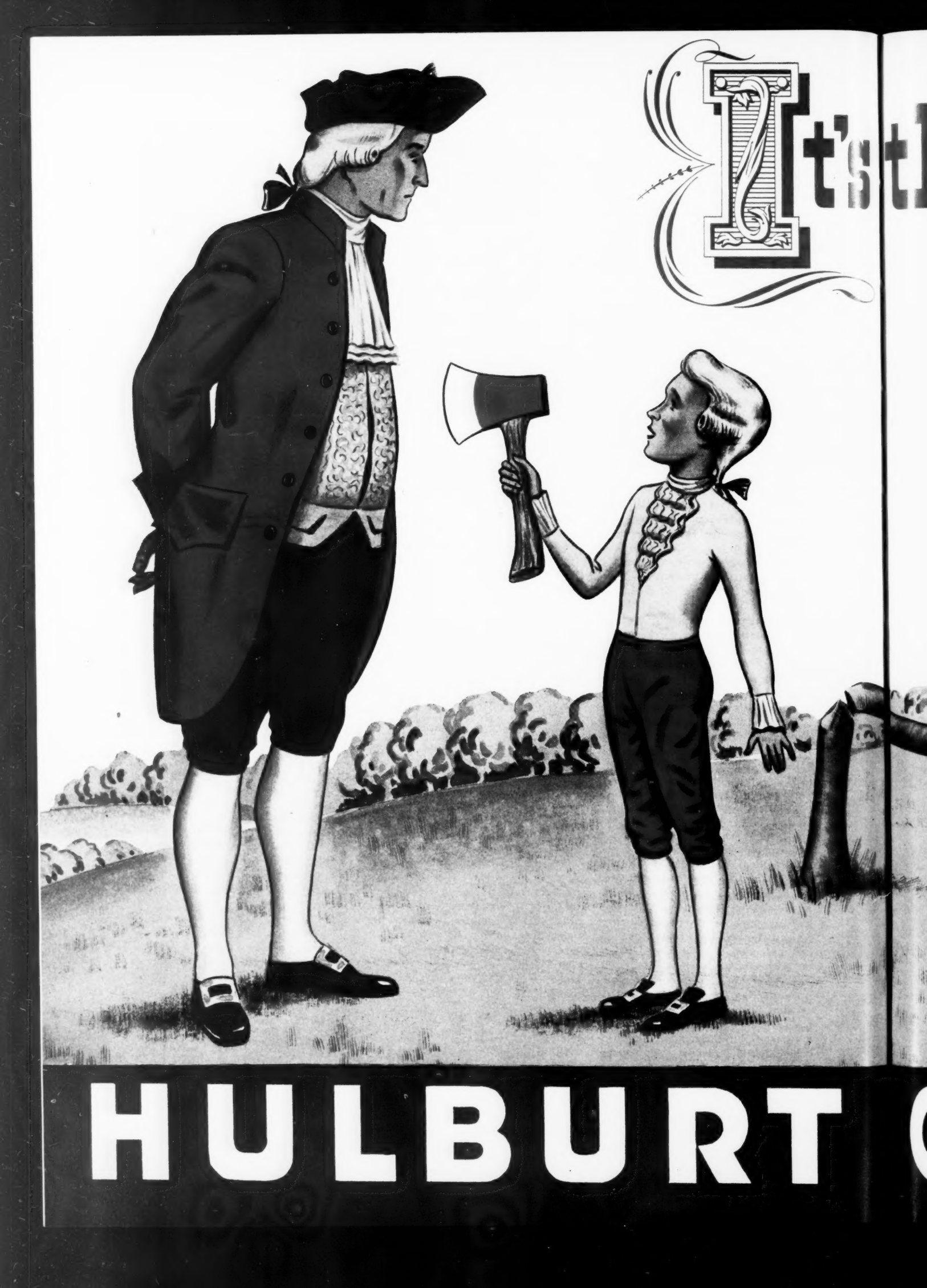
Only the pump at that point continues to be manually controlled, and this is done so that the water may be pumped only during off-peak periods, so as to make the demand for power more uniform. In dip-entry workings also self-priming centrifugal gathering pumps were installed. These pumps, with a capacity of 8,000 gal. per hour, weigh only 75 lb. complete and can be moved forward in advance workings as readily as blowers.

A Warren centrifugal pump with a capacity of 3,500 g.p.m. was installed by the Argyle Coal Co., Johnstown, Pa., to replace a 2,000-g.p.m. pump, and about 1,000 ft. of 12-in. was replaced with 16-in. wood pipe, thus enabling the company to handle more water with the same size of motor at a saving in power cost. Several bronze and iron pumps were replaced by 30-per-cent chrome-iron units by the Pittsburgh Coal Co.

At the bottom of Roslyn No. 5 mine of Northwestern Improvement Co., in Kittitas County, Washington, where the measures dip heavily, a sump with a capacity of 1,000,000 gal. has been provided. Fifteen hundred feet of 6-in. pipe and a 500-g.p.m. 500-ft.-head Worthington centrifugal pump equipped with a 75-hp. General Electric motor has been installed to remove this water.

A new main pumping station with an 800-g.p.m. 510-ft. dynamic head centrifugal pump with necessary motors, piping, dams, etc., has been installed at the Praco mine of the Alabama By-Products Corporation, in Jefferson County, Alabama.

With the installation of a propeller-blade fan which is rated to give 40 per cent more air than the old fan with the same power consumption, the Youngstown Mines Corporation is providing ample air at its Dehue


It's t
HULBURT

the TRUTH!

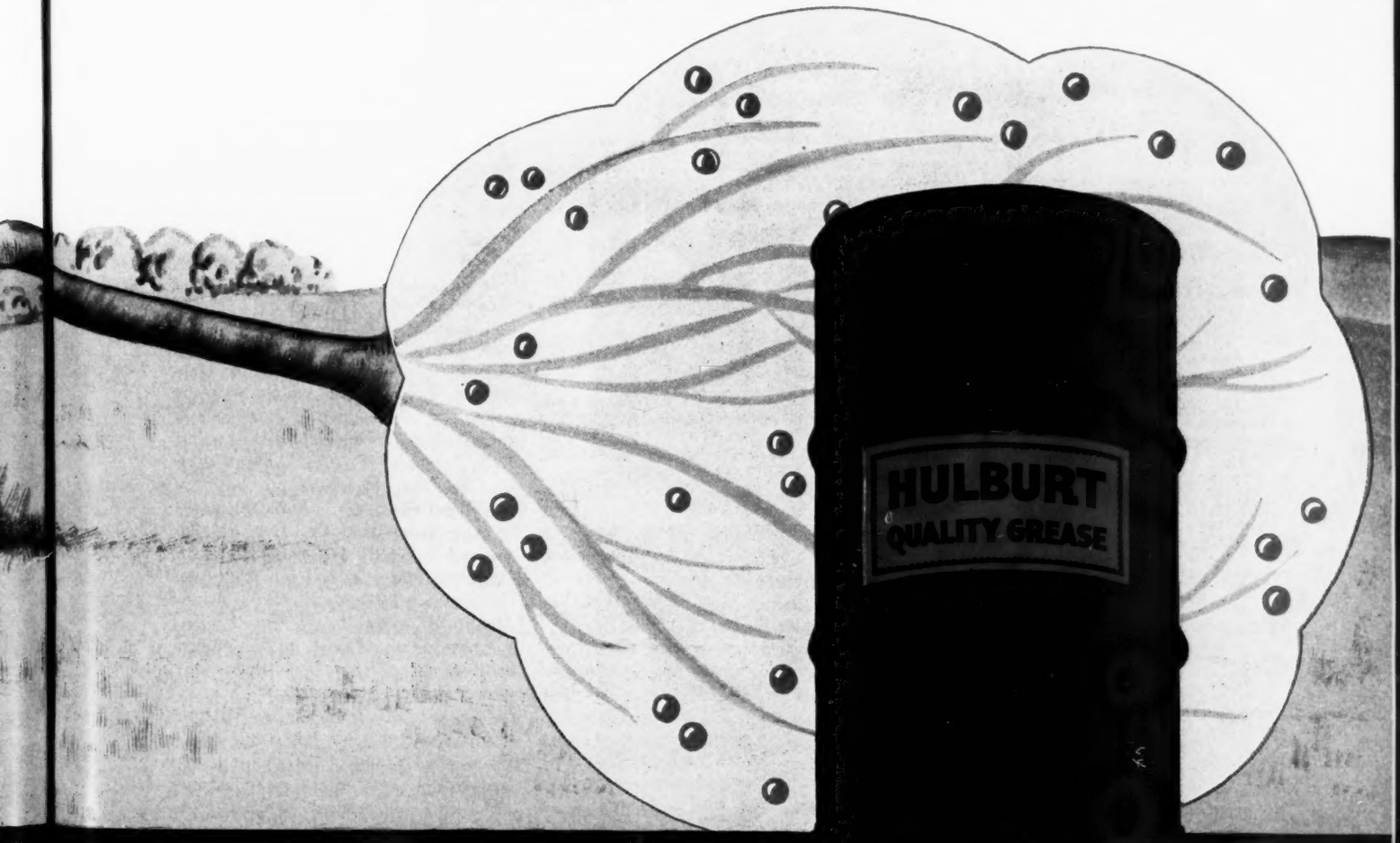
Hulburt Quality Grease cuts down friction losses and reduces maintenance costs.

Write today for a truthful demonstration.

HULBURT OIL & GREASE COMPANY

Specialists in Coal Mine Lubrication

PHILADELPHIA...PENNSYLVANIA



QUALITY GREASE

mine, in Logan County, West Virginia. Two new air shafts and three large fans are improving the ventilation of three mines of the Koppers Coal Co.

To improve ventilation, the Lake Superior Coal Co. has put in an Aerodyne fan at its West Virginia mine and the Alabama By-Products Corporation a similar fan at its Bradford mine, Dixiana, Ala. Aerovanes have been installed at the New Jellico mine of Walter Bledsoe & Co., Morley, Campbell County, Tennessee. The Pittsburgh Coal Co. also has acquired a portable propeller-type fan for emergency purposes. An air shaft 382 ft. deep has been sunk by the New River Co. to supply additional ventilation to the Summerlee and Lochgelly mines in Fayette County, West Virginia.

Revived interest in rock-dusting as a means of preventing explosions is to be noted in the purchase of two rock-dust distributors by the Lake Superior Coal Co. to replace similar but obsolete equipment and the installation of two additional high-pressure rock dusters by the Pittsburgh Coal Co.

A big propeller fan of the type used for mine ventilation.

Willow Grove mine of the Hanna Coal Co. of Ohio, Neffs, Ohio, will take water from Bull Run Creek, running it down a 270-ft. pipe into the mine, and this supply will be supplemented by water from a reservoir which will be piped for 130 ft. down the air shaft. When this is completed a water-sprinkling system will be established at every working face.

Tanks holding 120 gal. of water will be mounted on the sides of cutting machines, and from these small centrifugal pumps will draw water for spraying the cutter bits. It is estimated that 2,200 gal. of water will be used daily. Eventually 25,000 ft. of pipe will be needed, but the initial installation will require 3,600 ft. of 3-in. pipe, 1,800 ft. of 2-in. pipe and more than 6,100 ft. of 1½-in. pipe.

A high-capacity aerial tram displaced in 1940 a system of slate lorries and track at one of the mines of the Koppers Coal Co. Typical of the year has been the rehabilitation of 60 coke ovens at Holt, Ala., by the De Bardeleben Coal Corporation. The Dearth coke plant, a Connellsville operation, long disused, has been leased from the H. C. Frick Coke Co. and will be rehabilitated for operation by C. S. B. Ward, president, Wieman & Ward Co.

Another company actively participating in the demand for coke is the Hillman Coal & Coke Co. It has rehabilitated a number of coke ovens in Pennsylvania, some no longer near any coal mine. Coal is brought from considerable distances by truck. Apparently no difficulty has been experienced in getting refractory material for these repairs. The Sloss-Sheffield Steel & Iron Co. is rehabilitating 90 of a battery of 418 beehive ovens at Lewisburg, Ala., and the H. C. Frick Coke Co. 400 beehives at its Collier plant in the lower Connellsville (Pa.) region. But the byproduct people are not inactive. The Tennessee Coal, Iron & R.R. Co. will erect 73 byproduct ovens and the Alabama By-Products Corporation, 25 ovens.

Bathhouses are almost indispensable in these days, especially now that many more travel with automobiles long distances to their work. A washhouse built for 100 men by the Oliver Coal Co., Somerset, Colo., in 1940, is heated by a stoker-fired hot-air furnace with forced circulation of hot air for drying of clothes during "off"-periods. Ventilating system and hot-air circulating system provide for a complete change of fresh heated air in the building every 7 minutes.

With the circulating and ventilating system, the wettest clothes, wash cloths, etc., are thoroughly dried every morning, yet without a temperature high enough to damage shoes, hat bands or other leather goods. Each man has an individual locker, 16 in. square and 6 ft. high, constructed of 4x4-in. mesh hardware cloth for free air circulation. Water is heated by water coils installed in the heating plant.

In 1940, two store buildings were erected by the Koppers Coal Co., one at Kimball (Carswell mine), McDowell County, and one at Kimberly (Powellton No. 4 mine), Fayette County, West Virginia. They are both modern buildings, with self-service in the grocery department; they carry a full line of all types of merchandise. This same company has revised and modernized the water-treating at two of its operations so that it now conforms with State requirements.

During the year, Kopperston, W. Va., of the Koppers Coal Co., has been getting under way but its final completion for an output of 4,000 tons per day will not be reached until about April 1 of this year. Another development has been the opening of the mine of the Fort Dodge Coal Co. near Fort Dodge, Iowa, for the local market. A slope has been driven to the coal and a belt conveyor is used to raise it to the tipple.

Railroad Extension to Mine

In Floyd County, Kentucky, an Island Creek Coal Co. interest, the Princess Elkhorn Coal Co., has started development which will be served by a new ten-mile extension of the Chesapeake & Ohio Ry., starting from Prestonsburg, Ky. An outstanding development is the purchase by the New River Co. of 22,000 acres of land from the McKell Coal & Coke Co. and McKell Estate containing two operating mines in Raleigh County—Oswald and Tamroy—and a large undeveloped acreage in the Sewell seam.

An additional mine, to be known as Asco No. 2, has been opened at Asco, McDowell County, W. Va., in the Davy-Sewell seam by the Atlantic Coal Sales Co. An important operation with a shaft approaching the coal at the end of the year is one which is being opened by the Linton Summit Coal Co. three miles west of Dugger, Ind. This will be completely mechanized and have a cleaning plant.

RUBBER-TIRED HAULAGE

With Over 150 New Units Installed Makes Substantial Gains in Thin-Coal Mines

AN INCREASE of 220 per cent in units shipped to bituminous coal-mining companies featured developments in rubber-tired haulage in 1940. Shipments, according to data supplied by the manufacturers, totaled about 155 cars of all types, compared with approximately 70 cars in 1939. On this basis, the number of rubber-tired haulage units in the hands of coal-mining companies at the end of 1940, excluding a few older units known to have been retired from active service, was round 245.

Greater use in thin seams, with substantial increases in capacities of units used in thicker coal, marked 1940 progress. Cars were installed at several operations mining coal as low as 3 ft. On the other hand, a substantial number holding 7½ to 10 tons or more were acquired by companies with high coal. The year 1940 also witnessed installation of cars with adjustable auxiliary conveyor discharges to eliminate the use of car-loading elevators or sinking tracks for direct loading.

With the growth in number of rubber-tired units, increased attention was devoted to development of auxiliary equipment, including improved caterpillar or rubber-tired mountings for cutting machines and drills, drill and supply trucks adapted to trackless mining, special spray tanks for shortwall trucks and other auxiliaries.

Many rubber-tired units were installed without changes in the mining systems, chiefly room-and-pillar or block types previously employed. An increasing number of operations, however, adopted new plans based on a larger number of main and room headings to provide plenty of places during development plus working of rooms in groups of five to seven with crosscuts and other openings driven to route the rubber-tired equipment directly to the car-loading points. In addition, several mines adopted plans under which driving of room entries was eliminated entirely or incorporated into the regular room advance.

The principles underlying rubber-tired haulage (two or more large-capacity transportation units behind each loader) also were applied to track service at several mines. In these installations (see article beginning on p. 51), transfer stations are used to reload the coal into the regular mine-car equipment for haulage and hoisting. And one company went to the use of self-discharging scrapers for the shuttle operation between loading machine and gathering conveyor.

Although rubber-tired haulage was pioneered in Illinois in 1936, the major activity in 1940, as might be expected, was in the Appalachian region. However, the Middle West, including western Kentucky, added a substantial number of units, with additional cars in Colorado and new installations in Montana and Wyoming. In the latter State, the Sheridan-Wyoming Coal Co., as a result of a two-year study of mechanical mining, decided to reequip its Monarch mine and concentrate all operations there. Early in 1940, therefore, Monarch was supplied with three Joy 11BU loading machines, six 10-ton 60-D1 Joy shuttle cars, three Joy PL 11-3E elevating conveyors, three T1-1E Joy shortwall trucks, three Sullivan 7-B shortwalls with 9½-ft. bars and three Sullivan CD-16 rubber-tired drills. Cardox coal-breaking was adopted several

Shuttle car getting a load of over 6 tons of coal.

months in advance of installation of the new equipment, which replaced 5BU's, older-type shortwalls with 8½-ft. bars, post drills and track.

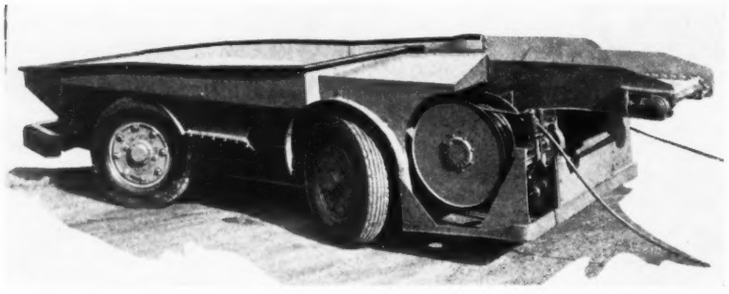
Monarch mine recovers the Monarch seam, 18 to 26 ft. thick. The original mining plan for shuttle cars was based on three-heading entries and driving groups of six rooms on relatively short centers. Several months of experience resulted in increasing the number of headings per cross entry to four and the number of headings per room entry to seven—branching out from three at the start. Number of rooms per group was increased to seven, and the thickness of the pillars was slightly more than doubled by increasing the centers. Results include elimination of serious congestion in development and better pillar work with higher extraction, greater safety in retreat mining and a lower operating cost. Two 5BU's still are used to date in development and working out corners resulting from the old plan of operation.

Peak output from one machine in a day has been 874.73 tons on the first 7-hour shift and 868.20 tons on the second shift. Production by months in the latter part of 1940 was: October—three 11BU's, 66,952.05 tons; two 5BU's 10,939.85 tons; November—11BU's, 76,369.20 tons; 5BU's, 10,719.85 tons; December—11BU's, 67,665.78 tons; 5BU's, 10,561.05 tons. All machines work two shifts per day. Tons per man-day in these months were:

	Loading Machine	Total Inside	Outside	Grand Total
October	39.14	20.95	56.34	15.32
November ..	39.51	21.06	56.10	15.32
December ..	39.12	21.47	51.79	15.18

The Consolidated Coal Co., already a user of Joy shuttle cars in its Jefferson No. 20 and Buckhorn mines, installed a Lee-Norse four-wheel-drive four-wheel-steering "Koal-Mobile" at its Mt. Olive No. 15 mine, Mt. Olive, Ill., late in 1940. The first of its type, the unit is equipped with a cable-reel and an adjustable-height conveyor on the rear end to discharge directly into mine cars. Capacity of the unit is 6½ tons, and it loads over the sides of mine cars standing a maximum of 58 in. over the rail. A second unit was installed in January, 1941.

Two special mining systems for rubber-tired haulage were developed in Illinois in 1940. In one, in use at the Blue Bird No. 6 mine, Blue Bird Coal Co., which pioneered the rubber-tired haulage idea developed by James H. Fletcher, room entries are entirely eliminated in favor of reneckking at intervals. The second system, developed for the Peabody mines in southern Illinois using Joy shuttle cars, provides for crosscutting at the correct intervals to form new room entries, thus eliminating separate driving of such openings. Both plans were described in the October, 1940, *Coal Age*, p. 76. Production from shuttle-car sections at Peabody's Harrisburg No. 43 mine, 4½ to 6½ ft. of coal, was averaging about 500 tons per machine shift, compared with 220 tons from production machines with mine-car changing. At Harco No. 47 mine, track-and-car machines were averaging around 275 tons per shift in 4⅓- to 7-ft. coal, compared with about 450 tons off machines served by shuttle cars.



Shop view of newly installed shuttle car with adjustable discharge conveyor.

A new addition to the mechanical-mining ranks in 1940 was the Blaine (Ohio) mine of the Lorain Coal & Dock Co., which installed seven Joy 7BU loaders, 5-ton Joy shuttle cars and Joy elevating conveyors. Goodman shortwalls with 8-ft. bars are moved on caterpillar trucks. Chicago Pneumatic 473 drills are employed with 3-in. sectional augers. The coal is broken with Cardox.

Both central and western Pennsylvania added materially to shuttle cars in use in 1940, with several installations in the central area in coal down to 3 ft. in thickness. Installations in western Pennsylvania went into the Lower Kittanning, Thick Freeport, Pittsburgh and Pittsburgh No. 8 seams. Kittanning thickness runs as low as 30 to 36 in. in certain areas.

Shuttle cars were applied to both thick and thin coal in West Virginia. Twelve cars with auxiliary equipment were added to facilities at the Federal No. 1 mine of the Koppers Coal Co., Grant Town, W. Va., mining the Pittsburgh seam. Some additional units also were added by the Consolidation Coal Co., which still was engaged in extensive experimentation with mechanical-mining equipment in 1940. Shuttle-car equipment also was increased by other companies in northern West Virginia.

Low-Vein Cars Installed

Several southern West Virginia operations also added to shuttle-car equipment, with a number of new users appearing in 1940. In practically all cases, average coal thickness was 40 to 52 in., going up to a little over 5 ft. at one operation. New installations included two low-vein shuttle cars with auxiliary equipment at the Nellis mine of the American Rolling Mill Co. The Lorado Coal Mining Co. mechanized its Lorado No. 2 mine, in Logan County, with Joy 14BU loading machines, Joy low-vein shuttle cars and Joy elevating conveyors. Cutting and drilling equipment corresponds to that at the Blaine mine (see above), and the coal is shot with permissible powder.

Eastern Kentucky developments were characterized by substantial increases in number of cars by previous users, as well as installations at new properties. In line with the trend in other fields, the majority of these installations were made in coal around 4 ft. in thickness.

With the 1940 additions to the list, available data indicate that the coal seams to which rubber-tired haulage has been applied include: Colorado—Laramie; Illinois—No. 5 and No. 6; Indiana—No. 6; western Kentucky—No. 9 and No. 11; eastern Kentucky—No. 5 and Elkhorn; Montana—Red Lodge; Ohio—No. 6, Pittsburgh No. 8; Pennsylvania—Lower Kittanning (Miller, "B"), Pittsburgh, Pittsburgh No. 8, Upper Freeport ("E"), Upper Kittanning and Thick Freeport; West Virginia—Alma, Chilton, Eagle, No. 2 Gas, Pittsburgh and Pocahontas No. 4; Wyoming—Monarch.

MINE SAFETY RECORD

Hard Hit by Bituminous Disasters; Anthracite Fatality Rate Decreased in 1940

By R. R. SAYERS
Director, U. S. Bureau of Mines

COAL MINING did not establish an enviable safety record in 1940. Although more coal was produced than in any year since 1930, the increase was accompanied by a heavier loss of human life than in any previous year since 1931. The increase in fatalities was apparent not only in the absolute number of deaths but also in the rates per million tons produced and per million man-hours worked. This increase—confined to bituminous mines—caused a rise in the rate for the industry as a whole in spite of a reduction, both absolute and relative, in fatal accidents at Pennsylvania anthracite mines.

1,418 Deaths in 1940

Final figures for 1940 are not yet available, but reports furnished by State mining departments to the Bureau of Mines showed an 11-month total of 1,245 men killed by accidents. This tentative figure may be swelled by other fatalities resulting from serious injuries that had not proved fatal when the reports for January through November were received. Experience gained in examining similar reports in previous years is the basis for estimating that the total number of fatal accidents during the full year will be 1,418. Should this estimate be confirmed by detailed reports from the operating companies, 1940 will prove to have been a year of large-scale production of coal obtained at a higher cost in human life per ton than in 1939.

Notwithstanding this regrettable fact, however, the death-per-ton rate in 1940 was more favorable than in any other year of the last decade except 1933, 1936, 1938 and 1939. Moreover, the death rate per ton in 1940 upheld the record of the industry of keeping the death rate per million tons below 3.00. The rate has not been as high as 3.00 since 1932. At no time previous to 1916 had the rate been as low as 4.00. From 1899 to 1911 the rate was consistently above 5.00. These observations neither excuse nor justify the relatively high rate of 2.82 now estimated for 1940, but do show that the higher rates for years previous to the launching of nation-wide safety endeavor in coal mining apparently are not again to be reached as long as conditions within the industry are kept under reasonable control.

Major explosions were the outstanding cause of the higher rate in 1940. Six major disasters* last year cost 274 lives. All of these disasters occurred in bituminous mines and all were explosions of gas or coal dust. In 1939, there was only one such disaster and a loss of 28 lives.

Dr. R. R. Sayers

Such a heavy loss of life emphasizes the need of greater care by mining companies to insure as low a production of coal dust as possible, maintenance of adequate ventilation to avoid dangerous accumulations of gas, use of the least dangerous type of explosives, and use of adequate quantities of rock dust to prevent local explosions from becoming of widespread and major proportions. About 60 per cent of the total production of bituminous coal from underground mines still comes from non-rockdusted mines; about 35 per cent comes from mines rated as "gassy" by the State mining departments; and about 52 per cent comes from mines using "non-permissible" explosives exclusively or in association with "permissibles."

Company Responsibility Great

With so large a part of the industry operating under hazardous conditions, the mining companies have a grave responsibility to insure the safety of the half million men employed by them and who work under such dangerous conditions. While men working underground may rightfully be expected to guard against careless ignition of gas, the mining companies have the responsibility of maintaining conditions so that gas will not accumulate in dangerous quantities with the possibility of being ignited by careless employees.

Because of the deaths resulting from explosions, the fatality rate for this class of accidents was the highest in any year of the decade 1931-40. The death rate from explosions was

* A major disaster is an accident causing the deaths of five or more persons.

0.46 per million man-hours of exposure underground and 0.64 per million tons of underground production. These figures do not compare favorably with the 1939 rates of 0.08 and 0.11, respectively.

By far the most important cause of fatal accidents—even in 1940—was falls of roof and coal. The fatality rate for this class of accidents is estimated at 1.03 per million man-hours of exposure underground, compared with 1.13 for the previous year, and 1.45 per million tons produced underground, compared with 1.53 for 1939. Fatality rates per million man-hours of exposure underground for this type of accident have changed but little during the last ten years, the highest rate being 1.28 in 1931 and the lowest 0.98 in 1933.

Measured on the basis of production, however, the death rate has shown some improvement, declining from 2.06 per million tons in 1931 to an estimated 1.45 per million tons in 1940. As the rate based on tonnage, instead of man-hours of exposure, is largely affected by increasing productivity of labor through use of machinery, the declining death rate per million tons mined does not indicate an equal improvement of the position of the individual exposed to the fall-of-roof hazard, although it does indicate a national social gain in the human-life cost of coal per ton.

Haulage accidents, usually second among the major causes of fatalities, fell to third place last year because of the large number of deaths from explosions of gas and coal dust. The estimated death rate from haulage accidents was 0.373 per million man-hours of exposure underground, as compared with 0.331 for 1939. During the decade ending with 1940 the rates have ranged from 0.312 in 1934 to 0.413 in 1937. These rates have shown a tendency to increase since 1934 and much work must be done to turn the trend downward.

Despite the large quantities of explosives used (estimated at 135,000,000 lb. in 1940), the annual death toll from explosives is only from 3 to 5 per cent of the total from all causes. In 1940 the percentage was 3 and the death rate per million man-hours of exposure underground was 0.061, compared with 0.058 for 1939. The range of the rates during the last ten years was from a "low" of 0.057 in 1934 to a "high" of 0.083 in 1935. About 42 per cent of all explosives used in coal mines last year were of "permissible" types, as compared with 40 per cent in 1939—an encouraging feature of the industry's safety record in 1940.

Electricity, although occasionally a serious hazard through ignition of gas which is sometimes followed by a major explosion of gas or coal dust, does not directly cause many fatal accidents. Only about 3 per cent of all fatalities are directly chargeable to electric current. The estimated rate for 1940 was more favorable than that for 1939—0.066 per million man-hours underground compared with 0.093. During the last ten years the rates for electricity have ranged from a low of 0.066 (estimated) in 1940 to 0.097 in 1931. The lowest rate previous to 1940 was 0.075 in 1935. Growing use of electrical equipment introduces increasing hazards that demand increasing safety measures if the death rate for this class of accidents is not to be permitted to increase.

Machinery Hazard Grows

Although accidents resulting from the use of machinery caused less than 3 per cent of the total fatalities in 1940, the machinery hazard is important because the rapid replacement of hand methods by machine methods of work has resulted in an upward trend in the yearly fatality rates chargeable to machinery. The rate for 1939 was 0.069 per million man-hours of underground work, compared with 0.033 in 1931. The apparent rate for 1940 was 0.047, which compares favorably with most of the other years since 1931, and it is to be hoped that this favorable rate will be confirmed by final reports from the mining companies.

Accidents other than those previously and specifically mentioned are responsible for a relatively small proportion of the total fatalities—less than 10 per cent in 1940.

The chief lesson to be learned from coal's accident record of 1940 is that a rapid increase in production requires more-than-usual attention to safeguarding employees from accidental injury and death. With the application of known and proved safety methods there is no sound reason why good market conditions should result in bad accident records. Long periods of relative freedom from specific mining hazards may create a false sense of safety. Safety requires as continuous attention as the production of coal.

Table I—Number and Causes of Fatal Accidents at Coal Mines in the United States in 1940.

Cause	From Actual Reports Covering 11 months, Jan.-Nov.			As Estimated for the Entire Year		
	Bituminous	Pennsylvania Anthracite	Total	Bituminous	Pennsylvania Anthracite	Total
Underground:						
Falls of roof and coal	470	90	560	557	100	657
Haulage	169	35	204	200	39	239
Gas or dust explosions:						
Local	12	5	17	14	4	18
Major	267	.....	267	274	.....	274
Explosives	25	8	33	30	9	39
Electricity	30	6	36	35	7	42
Machinery	23	3	26	27	3	30
Shaft	9	3	12	11	3	14
Miscellaneous	25	6	31	30	7	37
Total underground	1,030	156	1,186	1,178	172	1,350
Stripping or open-cut	11	4	15	13	3	16
Surface	38	6	44	45	7	52
Grand total	1,079	166	1,245	1,236	182	1,418

Table II—Fatality Rates per Million Man-Hours of Exposure at All Coal Mines in the United States, 1931–40.

Year	Underground [1]							Underground, Open-pit, and Surface [2]
	Falls of Roof and Coal	Haulage	Explosions	Explosives	Machinery	Electricity	Others	
1931	1.280	0.354	0.131	0.060	0.033	0.097	0.134	1.819
1932	1.198	.342	.323	.069	.053	.090	.084	1.897
1933	.979	.329	.068	.058	.042	.090	.090	1.480
1934	1.092	.312	.082	.057	.049	.089	.113	1.593
1935	1.106	.380	.082	.083	.058	.075	.122	1.695
1936	1.102	.338	.084	.076	.056	.077	.127	1.624
1937	1.089	.413	.174	.068	.057	.084	.093	1.741
1938	1.195	.327	.206	.067	.054	.079	.109	1.779
1939	1.129	.331	.084	.058	.069	.093	.080	1.589
1940 [3]	1.025	.373	.456	.061	.047	.066	.080	1.879

[1] Rates computed on man-hours worked underground.
[2] Rates computed on total man-hours.
[3] Preliminary figures.

ANTHRACITE MAKES

Even Further Advances in Its Use of Conveyors, Stripping and Fine-Size Cleaners

Conveyors below ground and draglines with automotive hauling equipment on the surface are transforming the anthracite region. Desire to obtain all the coal is making mandatory the operation of thin beds before, or sequently with, thick ones. Fine-coal classifiers are being installed to reduce disposal costs and space and to avoid the silting of streams that cause return of water to mines and other inconveniences. How to handle the water from one's bankrupt or near-bankrupt neighbors is one of the major questions of the anthracite region.

PROGRESS in the anthracite region has been running in the last year mainly to conveyorization, daylight mining and small-size preparation. Shaking conveyors, belts, scrapers and flight conveyors are mopping up the areas that earlier operation had left because they were too nearly level, yet not level enough for cars, or contained coal too thin for economical operation without conveyors.

Today, much thin coal is being mined. Even companies with thick coal are mining the thin beds because to remove the former first would involve the loss of the latter, wherever the thin beds are superposed on the thicker. Many of the problems involved in the high cost of driving headings partly in rock are being solved by using the already established roads in thicker beds for transportation and by tapping the higher beds through rock chutes, these upper beds, usually quite thin, being worked mechanically without necessity for road construction.

In any event, even though there may be no thick seam, two seams can be mined with economy from one roadway and the two thin seams may give as much coal as one of greater thickness. Exemplars of what can be done can be seen at the Exeter mine, Payne Coal Co.; Dial Rock mine, Dial Rock Coal Co.; Taylor mine, Moffat Coal Co.; and Clear Spring mine, Sullivan Trail Coal Co., to mention only a few.

Yet where the coal is thick and pitches heavily and the cover is considerable, the trend is to drive wholly in solid rock where there is no weak material like coal to be supported, because from such a base of attack provision can be made for forays through rock chutes to remove a large percentage of the coal.

Some companies, finding an extensive area of low coal, work it wholly with conveyors, excavating roadways and using cars only on its periphery, and some have done the same even when it constituted a small basin to which the coal could be lowered by shaking conveyors, along which the coal could be carried by other conveyors and from which the coal could be lifted by flight conveyors which in turn loaded the coal into cars. Thus, in the area covering the basin, roads and hoists alike were unnecessary, and speed in development was greatly accelerated.

At the Coal Rain Coal Co.'s plant, Junedale, Carbon County, the coal is taken out of the mine by a flight conveyor and dropped into pockets, from which in this instance it has to be trucked to the breaker. The use of this conveyor has reduced the number of maintenance men, trackmen and hoisting engineers who had been needed on the outside so long as the coal had to be hoisted in cars to the surface. The distance is short and for this reason a belt conveyor was not installed.

The Jermyn-Green Coal Co. found that, where roadways in rooms had been lightly silted, it was easier and much more conservative of time and labor to load out the silt onto a belt and shift it into the gob by scraping the silt off the belt by a suitably placed board than to cut a skip in the side of the pillar, but this applies only where rock has not been piled against the coal ribs, where the rooms have not caved and the pressure has not consolidated the silt.

Stripping now is making more progress than ever, especially since the dragline has been introduced. Most of the anthracite that is suitable for stripping lies on a heavy pitch. Flat coal usually is at the bottom of basins and is covered by hundreds of feet of rock cover and so cannot be stripped. However, secondary anticlines or saddles on the sides of the major dips sometimes bring the coal near the surface and give opportunity for a level stripping in fairly shallow ground. Then again in the most northerly area of the Northern field, the coal spoons out with the flat bottom of the basin spread out near the surface, under cover so light that shovel and dragline can claim such areas for their own.

More powerful stripping machinery is making possible the reopening of old strippings abandoned for what was at one time regarded as excessive depth. Everywhere can be noted places where a second slice of coal or more along the flank of an earlier slice is being taken, a tribute to the

larger, more competent equipment and better technique now available.

At Stockton, near Hazleton, the Central Pennsylvania Quarry, Stripping & Construction Co., in the Sugarloaf syncline, is following the coal down the south dip of the Mammoth bed beginning at the edge of the first, or outcrop, stripping. Though this method of mining has been continuously prosecuted in this area since 1932, the contract for the present work was signed with the Jeddo-Highland Coal Co. in May of last year, the new work actually starting, however, some time earlier.

Much of the overburden from earlier stripping, now piled over the coal, will have to be thrown back into the old stripping pit and may have to be handled twice. But much old and new material can be cast into the present pit. About 2,000,000 cu.yd. of cover will be cast direct by dragline and another 1,500,000 will be loaded into trucks and transported to the north of the stripping from 1,500 to 2,500 ft. with an average distance of about 2,000 ft.

Though started with the equipment formerly used on the outcrop stripping, a Bucyrus-Monighan walking dragline with a 200-ft. alloy-steel boom and an 8-cu.yd. bucket with manganese steel lip is now being employed. This machine will be used exclusively for casting. When the time comes to load the spoil into trucks, a Bucyrus-Erie 100-B with a 4-cu.yd. bucket will be used loading into Euclid units of 10 cu.yd. capacity.

Dike Will Exclude Creek

Coal also will be loaded into Euclid trucks by two 52-B Bucyrus-Erie shovels with 2½-cu.yd. buckets. Nine-inch holes will be drilled for breaking up the overburden. The strip pit is near Stockton. Near by the area is the sluggish and badly silted Hazel Creek, and a long dike is being built by the Jeddo-Highland company along the south side of the stripping for the protection of the latter.

Using a 500-ton Bucyrus-Monighan Type 6160 walking shovel with a 200-ft. boom and a 6-cu.yd. Page bucket, the Scranton Contracting Co. is uncovering for the Hudson Coal Co. an area of coal at Baltimore No. 5 Colliery, No. 10 Slope. Here the bed, which is the Baltimore, is 29 ft. thick, fairly flat, but with some steep rolls. Cover, a tough gray sandstone, is about 80 ft. thick. The boom of the shovel is of channel construction welded into a structural unit, and the wire-center cable is of 1⅝-in. diameter. Unfortunately, the coal already has been first-mined, and the workings are filled with débris.

In drilling, 1¼- and 1½-in.-diameter holes are sunk to a depth of only 35 ft. If drilled almost to the full depth of 80 ft., and of full diameter, the gases from the shot would escape through the creviced rock, more explosive would be wasted, and time would be lost redrilling the big masses dislodged, as was amply proved by early experience. The swing of the shovel averages 90 deg.

An effort is made to keep the end of the spoil bank in line with the end of the cut; thus the shovel is always behind the point where it is delivering spoil. It lays up a low bank and then when that is finished lays a bigger bank behind it, the small bank keeping the spoil from rolling into the cut. With a long boom, the spoil does not have to be stacked alongside, and none of the coal has to be placed temporarily on unstripped coal to be moved when another furrow has to be cut.

With another Bucyrus-Monighan Type 6160 walking dragline, A. J. Schrader, Inc., is stripping virgin coal for the Moffat Coal Co., but with a 165-ft. boom and an 8-cu.yd. bucket. A few years back, shovels were used exclusively for loading and equipment on rails plodded its way up devious paths to reach an elevated dumping point or even was lifted out of the pit by a hoist. That day is past. Work is now done with draglines, and the stripped material is cast to one side. If any material has to be hauled, that work is done by automotive equipment on gradients as uniform as those used for railroad dump cars, though in general the gradients are steeper.

Suggestive of the movement toward larger strip-pit equipment is the Reevesdale stripping near Tamaqua, Schuylkill County, of the Philadelphia & Reading Coal & Iron Co. The cover to be removed is about 10,000,000 cu.yd. On the job to act as strippers are one 6-W Bucyrus-Monighan diesel dragline shovel with 165-ft. boom and 8-cu.yd. bucket and a 5-W Bucyrus-Monighan diesel dragline shovel with 100-ft. boom and 6-cu.yd. bucket, a Marion electric 4161 dragline shovel with 100-ft. boom and 5-cu.yd. bucket, and a Marion electric 4101 dragline shovel with 90-ft. boom and 3½-cu.yd. bucket, also two Marion Type 40 diesel dragline shovels with 75-ft. booms and 3-yd. buckets

To load coal are two Marion Type 371 diesel 2-cu.yd. shovels and one Marion Type 331 ¾-cu.yd. gasoline shovel. Four Bucyrus-Armstrong drills for blast-holes, three R.D.-8 caterpillar tractors for road building and bulldozing, 20 Sterling trucks for hauling coal from the pits to the preliminary cleaner plant, compressor, welders, pumps, light plants, service trucks, and garage also are provided. A complete repair shop has been built near the stripping.

Mammoth, Buck Mountain, Holmes and Primrose beds will be stripped; the depth to which the contractor will go to recover coal will be determined by thickness of bed and depth of overburden. Coal thicknesses vary from 8 to 25 ft. Like all of the jobs of the Correale Construction Co. for the Philadelphia & Reading company, this one is equipped with a preliminary cleaning plant where all large lumps are broken down before loading into railroad cars for transportation to a breaker.

Coal Belted Over Highway

As a main State highway runs between stripping and railway siding, the cleaning plant is erected on the same side of the railroad as the stripping, and, after cleaning, the coal falls on a 400-ft. belt which, running 20 ft. above the highway, carries the coal to railroad cars. Thus, trucks do not have to cross the congested highway. A main concern where there are so many sections of pits and where the units have so often to be relocated is the building of roads for trucks. All waste from the cleaner and rock blasted in pits is used as base rock in the ballasting of roads.

Reserves of strippable coal, as J. H. Pierce, president, East Bear Ridge Colliery Co., has observed, are rapidly being exhausted, and when they are, allocation of production among companies no longer will be necessary. Once again will come the question, How is the anthracite region going to meet the demands of its market? How will the headings be driven fast enough to maintain the falling production with strip coal exhausted and coal banks and rivers divested of their spoils?

At least two mines have been obliged recently to provide large additional pumping facilities to take care of the water entering from idle operations, one, a two-company pumping plant, being in the Northern field and the other, the property of a

single company, in the Southern field. Much investigation has been made into this vexing problem of providing protection against the water entering active workings from abandoned collieries. It has resulted in efforts to prevent negligent and irresponsible persons from destroying or failing to leave adequate barrier pillars, to keep others from working under, or too near, large streams and to prevent water entering the mines from stream beds and through cave holes and strippings.

Water Tunnels Projected

The State is to be asked to provide for two tunnels, one starting near Herndon and running to a point a mile north of Mount Carmel and the other starting near Shoemakersville and running to Frackville and receiving at that point two branches each 6 miles long, one from Locustdale and the other from Mahanoy City. Both main tunnels will be 22 miles long. The first will discharge into the Susquehanna and the second into the Schuylkill, just on the Atlantic side of the Blue Mountains. An investigation has been started by the State into the alleged removal by Pasquale Adonizio (Tony Rose) of pillars separating the Sterrick Creek colliery from the Grassy Island workings of the Hudson Coal Co., in Lackawanna County. This alleged offense was the occasion of a suit last October between the Hudson Coal Co. and Mr. Adonizio for a loss claimed to be $150,000.

An Aerodyne fan with a capacity of 72,000 cu.ft. per minute and driven by a 1,000-hp. motor has been installed at the Coaldale colliery of the Lehigh Navigation Coal Co. Toward the close of 1939 the Huber power plant of the Glen Alden Coal Co. (*Coal Age*, May, 1939) received its full complement of machinery and was in condition to produce power to full capacity. The Henry colliery of the Lehigh Valley, electrified some time back, received its final electrical complement in 1940.

At Packer No. 5 colliery, the East Bear Ridge Colliery Co. is driving a single-track slope up a 25-deg. pitch so as to double the potential capacity from the Third to the Second Level. From this level the output is hoisted to the surface by a shaft.

For further development, the Edison Anthracite Coal Co. is sinking a 255-ft. extension to one of its Nesquehoning hoisting shafts to reach from the Third to the Fourth Level. This shaft consists of 3½ compartments, two of which are being used in the day shift during the sinking period for hoisting the regular coal production from the Third Level.

The third compartment is being used as a sinking compartment in the period from 4 p.m. to 7 a.m. This third compartment has been equipped with a double set of safety doors for the sinking operation. Sinking was started at the end of October, 1940, and probably will be completed by June 1, 1941. The Lehigh Navigation is studying the advisability of reopening mines Nos. 4 and 5, opened in the 1850's, closed in 1928 and now filled with water.

During the last year, the Susquehanna Collieries Co. completely remodeled its large breaker at No. 7 colliery, Nanticoke. The breaker has a capacity of 5,000 tons per shift and has completely changed its treatment of all sizes. These are now cleaned by the new-type Susquehanna cones.

Resuming during the past year the operation of the old Cameron colliery at Shamokin, Susquehanna Collieries is passing through that breaker the output of the Hickory Swamp, Hickory Ridge and Pennsylvania mines, making a new domestic blend of anthracite. The name of the colliery has been changed to Glen Burn. Many improvements were incorporated in the new operation, including a rotary rock dump with conveyors for discharge of mine rock, a concentrated machine-shop building, an office and many underground improvements. The colliery is now operating double-shift, producing about 5,000 tons daily.

Tests have been made of the possibility of cleaning by froth flotation fine coal dredged from the Susquehanna River at the Conowingo reservoir. For fine coal a good market exists, awaiting only the willingness of industrial concerns to erect machinery for mixing these sizes with low-volatile coal, which machinery they will provide if assured of a continuous supply of fine anthracite at present prices.

At Milnesville, near Hazleton, a washer to clean 60 tons of bank coal per hour, all 3/16-in. to 100-mesh, has been erected and is being operated by the Hydrotated Anthracite Fuel Co., Inc. This coal comes from an old million-ton bank adjacent to Lattimer Mines which for the most part consists solely of such material, though below this fine coal are all sizes up to egg. About 80 per cent of the coal is marketable, so the output should be about 48 tons per hour.

As the coal bank is quite close to the washer and towers above it, the coal is readily brought by a bulldozer to the 100-ft. conveyor which feeds the washer. This conveyor, with its 6x18-in. drag flights, driven by a 10-hp. motor at 100 ft. per minute through a Cleveland worm-gear reducer, travels from the bank to the washer in a covered gantry.

The coal passes directly to a 7-ft. Hydrotator, after which it passes over a Selectro vibrating screen driven by a 7½-hp. motor, where all coal under 1/32-in. is removed. It then travels over another Selectro vibrating screen, where it is thoroughly dewatered before going directly to railroad cars by a stationary stainless steel chute.

A mine in the Eastern Middle Anthracite region is cleaning fine coal by a classifier designed specifically by E. I. duPont de Nemours & Co. for coal of sizes ranging from 5/16- to 3/32-in. and from 3/32-in. to 4-mesh. The classifier has ten water columns arranged around a shaft, and each column has three zones. Feed is introduced into the water of the first column—for it *is* water, not a heavy liquid that is used. The water in this column has no upward movement.

Water Slidden Over

From this column the particles are carried in turn by the continuous relative rotary movement of the three zones to each of the next seven columns, where it meets successively increasing upward currents of water. These complete the classification and drive the marketable material out of the tops of the columns. The larger particles of rock and slate which also enter with the feed settle to the bottom of the machine and are moved by the zoners to the other two columns, which are filled with still water. Thence they are removed through bottom outlets and discarded.

It has long been recognized that fine particles falling in even a light liquid such as water will become so stabilized by the presence of a high percentage of solids that classification will be slow or will even virtually cease. The function of the zoners is to remove the stabilized material to another column where classification can be resumed. The Pennsylvania Coal Co. also is working on plans covering the preparation of buckwheat Nos. 4 and 5, and the Lehigh Navigation Coal Co. at its Tamaqua colliery has installed a No. 5 buck-

wheat coal cleaner, designed by its own engineers.

Calcium chloride is being used by the Pennsylvania Coal Co. to prevent coal from freezing in transit during wintry weather. The Susquehanna Collieries Co. finds that quite a few of the dealers request that the anthracite shipped them from pea down to No. 4 buckwheat be treated during freezing weather, and are pleased with the results. About 100 lb. of flake calcium is used in a 50-ton car.

During last winter's severe weather, no form of heat had to be used to release the coal when thus treated. On the other hand, oil is used by the East Bear Ridge Coal Co. on the finer sizes.

Among those trademarking coal is the Susquehanna Collieries Co. It so distinguishes its Lykens Valley prepared coal, also the Glen Lyon and Glen Burn coal going to New England and the coal retailed locally at the Glen Burn colliery. Disks are used for this purpose whenever the coal is loaded at the breaker whether into retail pockets or into railroad cars. These disks are treated with a special waterproof material and, though much of this coal is dumped over piers and transported in barges to New England, the disks are still in good condition when the coal is delivered to the ultimate consumer.

As the year draws to a close, it appears likely that 1941 will see much preparation activity. The Harry E. Coal Co., West Pittston, Pa., an affiliate of the Anthracite Coal Co. and the Sullivan Trail Coal Co., has awarded a contract to Koppers Rheolaveur Co. for three 12-ft. and one 10-ft. Koppers Menzies cone separators to be installed in the new cleaning plant now being built at Swoyersville, Pa., near Wilkes-Barre. The four units will have an aggregate cleaning capacity of 590 tons hourly. One 12-ft. separator will clean egg and stove, another nut, a third pea and buckwheat No. 1 sizes. The 10-ft. separator will clean rice and barley. Refuse will be cleaned in Menzies cone separators. Egg, stove and chestnut will be cleaned in an 8-ft. unit; pea, buckwheat, rice and barley in a 4-ft. unit. A second 4-ft. unit will clean buckwheat. The three separators will have a total cleaning capacity of 114 tons per hour.

Though temporarily the coal of Exeter colliery, the breaker of which burned last Christmas, will be cleaned by night at the William A colliery of the Kehoe Berge Coal Co., Avoca, it is likely that before long a breaker will be erected at Exeter to replace that built in 1871. Another breaker now under construction known as No. 6 and to be operated by the Hydrotated Anthracite Fuel Co. will be located at Milnesville and will be used primarily for reclamation of bank coal. This plant, to which reference is made in the table, should be completed by March 15. It will be equipped with a 13½-ft. Chance cone, a 4-ft. and a 6-ft. Hydrotator also with a 12-ft. Wilmot classifier and will provide for the recovery of coal in all sizes from stove down to, and including, buckwheat Nos. 4 and 5. Provision also has been made to prepare freshly mined coal from mines in the Hazleton region. Two other cleaning plants in the Southern Anthracite Field are under consideration.

Efforts to reduce operating costs are being made also in the mechanical departments of the anthracite region, of which work that of the Hudson Coal Co. is typical. One of these is resistance, or spot welding, by that company, of the several parts of shaking chute pans (*Coal Age*, January, 1941, p. 55), but this practice dates from the year before last. Other recent economies of the same company are the prompt classification of scrap iron on arrival at the Olyphant colliery (*Coal Age*, January, 1941, p. 70), the use of discarded shaker chutes for lagging inside and outside the mines, the repointing of crusher teeth with a hard alloy and the use of steam from stationary boilers when the colliery is idle, to keep locomotives under pressure, thus making it unnecessary to provide hostlers at such times and making a further saving by a more economical use of coal. Piping is run from the stationary boilers to the boilers of the several locomotives.

Savings in Car Repairs

An example of scientific management is the new car-repair shop of the Pine Ridge Colliery of the same company, where production-line methods will be put into operation. Each of the six two-man crews working on one of the six cars under repair will be serviced by three mechanical tools which will be attached to their sources of power and not disconnected at any time. These three tools are so located as to be available on all four sides of the car under repair. No longer will men wait on one another when tools are needed and no longer will they have to drag long pipes and leads from place to place, connect and disconnect them with all the annoyance, delay, battered threads, etc., so usual in this connection. These tools will be an electric drill, an air-operated chipping hammer for knocking off bolts and a mechanical wrench for screwing on others.

At present one crane will service the six repair stations, but each station will have its own store of repair parts and its stack of suitably cut planks. Later, if found necessary, other cranes will be added.

New Anthracite Preparation Facilities in 1940*

Coal Company	Plant Location	Capacity, Net Tons of Feed per Hour	Preparation Equipment
Clifford Bressler	Pine Grove, Pa.	14 [1]	Deister Concentrator [2]
Colitz Coal Co.	Pottsville, Pa.	12 [1]	Deister Concentrator [2]
		12	Menzies [3]
Evans Coal Co.	Beaver Meadow, Pa.	20 [1]	Deister Concentrator [2]
Green Top Coal Co.	Jessup, Pa.	12	Menzies [3]
Harry E Coal Co.	Swoyersville, Pa.	590	Koppers-Rheolaveur [3]
Heidelberg Coal Co.	Avoca, Pa.	12	Menzies [3]
Hudson Coal Co.	Scranton, Pa.(4)	300	Chance [4]
	Powderly, Pa.	150	Link-Belt
	Scranton, Pa.(2)	50	Wilmot [5]
Hydrotated Anthracite Fuel Co., Inc.	Milnesville, Pa.(6)	100	Wilmot [5]
	Milnesville, Pa.	75	Wilmot [7]
Jermyn-Green Coal Co.	Pittston, Pa.	18 [1]	Deister Concentrator [2]
		22	Menzies [3]
Jonathan Coal Mining Co.	Barry Station, Pa.	10 [1]	Deister Concentrator [2]
Locust Coal Co.	Shenandoah, Pa.(5)	22 [1]	Deister Concentrator [2]
Morgan Coal Co.	Old Forge, Pa.	70	Menzies [3]
Motley Coal Co.	Mayfield, Pa.	12	Menzies [3]
Necho Coal Co.	Donaldson, Pa.(5)	75	Deister Machine [8]
Pompey Coal Co.	Jessup, Pa.	12	Menzies [3]
Pottsville Coal Co.	Port Carbon, Pa.	18 [1]	Deister Concentrator [2]
Roy Risser, Inc.	Beaver Brook, Pa.(2)	52	Menzies [3]
Sullivan Trail Coal Co.	West Pittston, Pa.(3)	56	Menzies [3]
Supreme Anthracite Coal Mining Co.	Peckville, Pa.	22	Menzies [3]
Raymond A. Wren	Williamstown, Pa.(2)	36 [1]	Deister Concentrator [2]

* Including rebuilt plants and major installations of preparation equipment in existing structures. Where more than one unit of preparation equipment was installed, the number appears in parentheses after the plant address.

[1] Washed-coal capacity. [2] "Super-Duty Diagonal-Deck" coal-washing tables. [3] Menzies or Koppers-Menzies cone-separator equipment. [4] Chance sand-flotation coal-cleaning equipment. [5] Including Wilmot Hydrotator coal-washing equipment. [6] Total breaker capacity, 1,250 tons of feed per hour. [7] Silt-reclamation plant, including Wilmot Hydrotator washing equipment. [8] Plat-O coal-washing tables.

RENAISSANCE IN COAL

Foreshadowed by Rising Interest In Sound Research and Adequate Promotion

By CLYDE E. WILLIAMS
Director, Battelle Memorial Institute

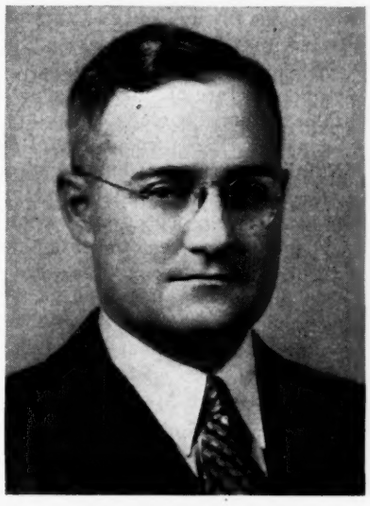
THE USE of coal in our modern world is a tremendously important thing. But two decades marked by dwindling markets, falling prices, difficult problems with labor and profitless operation have sorely tried the coal-producing industry. Executives in this industry have made important progress in recent years in dealing with these problems. Still more important than this, however, is the new spirit of progressiveness that has been embraced by this industry. Just as in history the Renaissance of the 15th century resulted in a marked progress in civilization, so this new spirit in coal will cause it to take its rightful place as a powerful and profitable industry.

Orderly Marketing Helps

That such a renaissance in coal may actually be under way now has been indicated by developments of the last few years which became particularly marked during 1940. The long prevalent idea that price-cutting was an essential feature of the industry was being put aside even before the Bituminous Coal Act became effective. Even if this law should fail because of the weight of its cumbersome machinery, its example and the experience of the successful marketing agencies should be so salutary that price-cutting should not return to plague the industry.

The idea that price-cutting is the only way to stop the encroachments of competitive fuels has been shown to be false. The true way is to make coal the equal of or the superior to oil and gas in uniformity of quality, convenience, and cleanliness as well as in economy. We are following the true path. Mining methods, preparation plants, and treating processes have been developed to improve and maintain uniformity in the quality of the coal produced for all types of users.

Realization has come that coal, as well as oil or gas, must be used in equipment designed and built to suit its characteristics. Smokeless combustion and attention-free operation would not be possible with oil and gas if they were burned in equipment of the type used by our fathers and grandfathers. This is what has been too often attempted with coal. In large power plants, proper equipment has been developed and coal is displaced there only when the cost is definitely shown to be higher than possible with other fuels. Stokers bring to the home relative smokelessness and convenient, automatic operation. Throughout the last ten years, they have made rapid gains and in 1940 far surpassed their sales of previous years.



Clyde E. Williams

Better Stokers Needed

Pleasing as the advances in residential stokers are to their manufacturers and to the coal industry, further improvements to make them more completely smokeless and more completely automatic are sorely needed. Similar progress in equipment for the vast number of homes that are heated by stoves is necessary. In the other direction lie metallurgical and other process industries that now use oil or gas, not because these fuels are better but because equipment for their use makes them so simple to control that they are often used despite their higher cost. Vast markets are available to coal if the proper equipment for its use in these industries is developed.

The idea that coal is coal and that every plant and every piece of equipment is a prospect for every grade of coal is now outmoded. Coal salesmen have found that engineering knowledge is essential. Rare indeed is the successful company that does not back up its sales force with engineers to analyze the requirements of the user to determine whether its coals match those requirements. Accurate information is demanded not only on the proximate analysis and the heating value but on the swelling characteristics, the coking tendencies, the

grindability, and the fusion temperatures of the ash.

For many years, the coal industry has indulged in wishful thinking about a probable short life of our oil and natural-gas reserves. Typical of the honest but misinformed statements are those made in 1925 in "The Case of Bituminous Coal," an economic study of the industry by the Institute of Economics: "Natural gas seems certain presently to lose its very frail position in the industrial system. Oil seems unlikely to make serious inroads upon coal; for oil, like natural gas, is a rapidly wasting asset."

We are secure in the knowledge that coal is sufficient for thousands of years to come but our knowledge of the life of oil and gas is still indefinitely assured. They, too, may last a long time. Wishful thinking about the passing of competition is giving way to the conviction that to assure its position among our sources of power for the future we must know better how to utilize it.

Coal Also Raw Material

But coal is not only a source of heat and power; it is a chemical raw material whose potentialities are boundless. To realize these potentialities fundamental investigations must go on unceasingly to unlock the secrets of the constitution of coal and of how to utilize the constituents. Such studies may today appear quite pointless to those who look upon coal merely as something to burn, but to those who need cheap chemical raw materials a search for the key that will open the gate to a great storehouse of wealth is an obviously intelligent procedure.

Executives of many industries have been fired with the spirit of research. The investments they have made in research have yielded them handsome dividends. In our homes, our automobiles, our trains, our airplanes we enjoy the fruits of fundamental and engineering research. To a small extent, this spirit of research spread to the coal industry some years ago. Individual producers and small groups made use of it to solve some of their pressing problems.

Now this spirit is spreading throughout the entire coal industry. Producers have come to realize that the great problems—the chemistry of coal and the development of processes and equipment for its use both as a chemical raw material and as a fuel—are common to the entire industry, from Pennsylvania to Washington and from Michigan to Alabama. In this industry, in which the largest single unit produces less than 3 per cent of the entire output, one unit or a small group cannot expend the money for the program that is required. Nor should they, for research on one coal will benefit all. Cooperative rather than individual effort is necessary for maximum benefits.

Bituminous Coal Research, Inc., was the result of the conviction of a group of leaders of the industry that the time for joint effort had arrived. In its program of 3½ years from 1935, with the modest funds at its disposal, it developed information on the relative efficiencies and costs of fuels in domestic heating; on the properties of coals for residential stokers; on combustion in fuel beds of large stokers; on the sizing of coal for underfeed stokers and pulverized-fuel equipment; on the application of coal to the drying of hay; on the combustion space requirements of coal burned on stokers, and on the dustless treatment of coal that has repaid many times to the industry the money invested.

With the exhaustion of the funds originally collected the program for further research had to be temporarily recessed while further support was being obtained. The support necessary for a minimum rate of effort, greater than before but still modest in relation to the needs of the industry, has recently been obtained and the program is getting under way.

Problems to be attacked include the development of smokeless and convenient kitchen ranges and heating stoves; the principles of more automatic combustion equipment for the home; the dustless treatment of the porous, low-rank coals; the application of coal to the internal-combustion engine, and the utilization of coal in the metallurgical and ceramic industries. All of these, it will be seen, are practical engineering problems aimed directly at the application of available knowledge of coal to the development of equipment and methods that will result in regaining old markets and in securing new ones.

The old ideas that the bituminous coal industry was one that could be pushed about by other industries, by government, or by labor and that it could not help itself out of its difficulties are being proved false. The program of research fits directly into the program of the recently organized Bituminous Coal, Inc., also sponsored by the National Coal Association, aimed at reshaping the public attitude toward the industry by advertising the advantages of coal as a source of energy. Advertising today must be based on sound premises, and no sounder premise can be found than the program of Bituminous Coal Research, Inc.

While the proposed budget of $900,000 annually for the promotional program rather dwarfs the $70,000 annually which is the total to be expended for research through Bituminous Coal Research, a better balance may be expected later. This balance will come not by a decrease in the promotional effort but by an increase in the research effort. This balance is essential if the promotional campaign is to continue. Advertising of present advantages of coal can accomplish great things for the industry, but future advertising of new developments that can come about only through research can accomplish greater things.

Coal Supply Assured

Improved methods of mining and preparation adopted during the last twenty years insure that our mines can adequately supply the coal for coke, for power, and for heat that is demanded by the program for national defense. The coal-carrying railroads are better equipped for its transportation than in the previous similar emergency. The advancements that have been made in the efficient use of coke in the production of pig iron, in the utilization of coal in locomotives and in steam boilers make necessary the mining and transportation of much less coal for the same output than was required twenty years ago. Thus the industry is well prepared to care for its part of the defense effort, and repetition of the difficulties of the former World War period should not occur.

Production of 452,000,000 tons of coal in 1940—the highest in ten years—and the prospects of an increase by as much as 200,000,000 in the next three years does not mean that the lean days are gone forever. The program of rearmament will pass and, in the years to follow, the demand for coal may again decrease. If that period is not to bring grief to the industry again, the renaissance that has been observed must be real; the old and obsolete ideas must be shed forever. In bad times as well as in good, the industry must continue to apply research and to tell its story to the public so that the gains made will remain and progress will continue.

POWER GAINS

Paralleled by Maintenance Advances In Year of Active Equipment Installation

NEW HIGHS in efficiency and reliability marked 1940 developments in coal-mine power. Advances in mechanization of loading underground and cleaning on the surface were reflected in increases in a.c. and d.c. connected horsepower. This in turn resulted in greater attention to selection of the most efficient types of motors and controls, paralleled by wider employment of industrial units, increased use of equipment for correcting power factor and protecting against surges, installation of improved conversion units for supplying d.c. power, and closer regulation of d.c. face voltage by new feeder installations and extensions, moving substation units and otherwise perfecting distribution facilities and practices.

Better Motors Used

Better materials and a wider use of fan cooling and forced ventilation have made possible more efficient motors for mine applications. In many cases, fan cooling, in addition to other measures, has made possible motors of the same or only slightly larger dimensions than open-type units, while better materials enable motors in severe service, especially totally inclosed applications on cutters, to give the continuous service necessitated by modern mechanical mining. In addition to forced ventilation on an increasing number of units, high-speed self-ventilated motors, following their successful use on street cars and trolley buses, also were applied to haulage locomotives. New controls for gathering locomotives are designed to facilitate loading-machine service, while pneumatic contactor systems were more widely applied to haulage units. Magnetic contactor control was almost universal on loading machines and was widely used on cutters.

Advances in the design of the mechanical parts of mining equipment kept pace with those in electrical equipment. Anti-friction bearings, improved sealing of bearings and gear cases, high-strength alloy steels and hard-surfacing of parts subject to wear are cases in point. Resistance to corrosion also was a factor in several applications, such as sheets for mine cars. Maintenance practices at mines were tightened still more, with major attention given to the training of additional electricians, mechanics and repairmen. The electric welder and cutting torch found even wider use, and many companies added to shop facilities and machine-tool equipment.

Lubrication of mining equipment, particularly of loading and cutting machines, got a thorough overhauling at an increasing number of operations, including research into most efficient types of lubricants, sealing to prevent loss and damage to equipment, prevention of contamination and loss in handling and report systems assuring regular, adequate application. To assist in attainment of these goals, a number of pressure-type lubricating trucks were installed.

Purchased Power Leads

Purchased power's predominance over mine-generated power continued at railroad-shipping mines. At truck mines, most producers of over 200 tons per day continue to buy power, while the majority with smaller outputs generate electricity, where used, with oil or gasoline engines. In some districts, mines producing only 20 to 30 tons per day have power plants and electric cutting machines. Electric mainline haulage is employed at operations in Ohio and elsewhere running less than 100 tons per day. Gasoline engines usually power the generators at small mines, with diesel engines as the prime movers at most mines in the 50-to-200-ton class.

Replacement of gasoline and old-type low-speed diesel units with high-speed diesel engines was a highlight of 1940. Installation of shaker and vibrating screens, pressure for more coal and promised economies in engine maintenance and fuel cost were the principal factors underlying the trend.

No Rise in Power per Ton

While additions to underground and surface equipment worked to increase kilowatt-hours per ton, more copper, better regulation of power factor and increasing production worked to keep it down. Largely as a result of increased output, total energy consumption by the coal industry jumped materially in 1940. Kilowatt-hours per ton, however, probably did not differ materially from the 1939 figure. Most railroad-shipping mines in the bituminous industry probably fall in the range of 4 to 9 kw.-hr. per ton. Only a few approach or exceed the 20-kw.-hr. mark not uncommon at anthracite mines.

Large bituminous strip mines use only 25 to 50 per cent more power than deep mines in the same seam of coal with 250- to 330-ft. shafts. In 1940, as an example, a large Illinois

stripper removing 57 ft. of overburden to recover a 6-ft. seam used 9.9 kw.-hr. per ton. The operation includes an elaborate cleaning plant and all activities except transportation are electrified.

To meet rising demands for power, several companies added prime movers and generating equipment. One of these—Union Pacific Coal Co.—installed a 7,500-kw. turbo-generator and two more pulverized-coal-burning boilers to its Rock Springs (Wyo.) power plant. In southern Illinois, the Pyramid Coal Corporation scheduled construction of a new mine power plant. Several companies in southern Illinois, as well as in other areas, partly or completely solved the question of disposing of deduster dust over and above what could be sold by using it as a fuel. The Mt. Olive & Staunton Coal Co., as an example, fed excess minus 28-mesh dust to Illinois spreader-type stokers under two 500-hp. water-tube boilers. This company generates about two-thirds of its power at 2,300 volts and distributes it to the mine m.g. sets through boreholes. All top power is purchased.

Illinois operators, with those in other fields, also were active in the installation of capacitors for the correction of power factor, and one company operating its own steam plants was using a synchronous condenser for emergency correction. A combination of capacitor and lightning arrester was increasingly used at mines in 1940 to protect rotating machinery from lightning. The capacitor slopes off the steepness of the incoming lightning surge and the arrester limits its magnitude.

D.c. power additions and extensions resulting from increased mechanical mining and rising output in 1940 included the Koppers Coal Co.,, which added to feeder cable and installed six additional substations with a total capacity of 1,800 kw. at its various properties. The Buckeye Coal Co., Nemacolin. Pa., a subsidiary of the Youngstown Sheet & Tube Co., improved distribution by establishing surface substations near sections using mechanical loaders and taking the feeder cable into the mine through boreholes.

Increased use of mechanical-mining equipment focused greater attention on power supply in 1940.

The Westmoreland Coal Co., operating in Westmoreland County, Pennsylvania, installed two sets of air-cooled transformers to serve inside substations in 1940. Simplification of substation construction and ease of moving the transformers are expected to result in widespread use of such equipment in the future.

Mercury-arc rectifiers held their lead in the field of new d.c. conversion installations, although rotary equipment still was preferred in some instances. In the mercury-arc field, some 21 "Ignitron" units were in active service at the end of the year, 13 supplying 250 to 275 volts d.c. and eight supplying 550 to 600 volts. New installations included a 300-kw. unit by the Pittsburgh Coal Co., which also changed several manual switchboards in existing substations to automatic.

Districts using mercury-arc equipment were increased by the addition of the New River field in 1940, where, in addition to another substation for additional power at Cranberry mine, a 500-kw. 550-volt Westinghouse Ignitron unit was installed by the New River Co. to feed the Lochgelly and Summerlee mines. At these operations, the trolley is positive and the rail negative. This polarity was made possible by insulating the tanks from the ground after repeated breakdowns across the mine hangers in the first few weeks of operation with the trolley negative and the rails positive—the usual polarity with a rectifier. With the trolley negative, electrolytic action seemed to bring certain chemicals down out of the wet roof onto the hangers. Whatever the cause, however, all difficulties disappeared when the rectifier tanks (cathodes) were connected to the trolley and the anodes to the rails, thus providing the same direction of current flow as in the several adjoining mines supplied by 550-volt m.g. substations.

Converter Efficiency High

The high efficiencies of rectifiers, with resultant annual savings of $1,000 or more per unit, directed increased attention to the fact that rotary converter efficiency is higher than that of m.g. sets. On that score, some men that chose converters some years ago are patting themselves on the back, especially where the power factor of the plant is maintained at a satisfactory figure by other means, such as capacitors or synchronous motors on fans and pumps.

The fact that motor-generators do not require transformers still results in their being favored for some underground applications. As an example, a large southern West Virginia operation recently was equipped with a new Westinghouse 300-kw. 275-volt synchronous m.g. set with full-automatic board preparatory to introducing mechanical loaders and high-duty track-mounted cutters.

Provisions for improving d.c. distribution, including more copper, better bonding and greater stress on balancing positive feeders and returns to reduce voltage losses to a minimum, also were accompanied by wider use of sectionalizing equipment to isolate areas where faults occur or to cut off power when certain areas are idle. Equipment ranged all the way from manually operated feeder and trolley switches to full-automatic reclosing breakers.

Power-cable systems and control ar-

rangements for conveyor work received much attention in 1940 at mines using open equipment, although such systems were subject to radical differences. In gaseous mines, where requirements are rigid, methods are more or less standardized because of the use of permissible or gas-tight controls and fused permissible junction boxes. When Miller connectors are used with such installations, the halves are held together with chains and padlocks.

In contrast to the usual system in non-gaseous mines employing standard fused switches, connecting boxes and cable connectors, distribution of 440-volt 3-phase power to the belt, chain and shaker conveyors in a new mine of the Wise Coal & Coke Co., Dorchester, Va., is based on rubber-covered cable containing four conductors (one a ground) from transformers to equipment starters. No fuses are used. Through-type and branch connections for all cables are made with Miller connectors plugged to "gangs" especially designed for the job but factory built. These gang boxes are provided with both male and female connectors so that the male plugs of cables and gangs, if not inserted, are always without power (*Coal Age*, December, 1940, p. 47).

Switches Stop Belts

Roller switches were among the new equipment for control of underground belt conveyors employed in 1940. These cut the power off the driving motor if the belt stops for any reason, including slippage of the head pulley. At the Bankston Creek Co. 5 mine, Bankston Creek Collieries Co. (an affiliate of the Sahara Coal Co.), Harrisburg, Ill., the General Electric roller switches are combined with signal lights to indicate if the power is off and also show where the interruption occurred (*Coal Age*, April, 1939, p. 80).

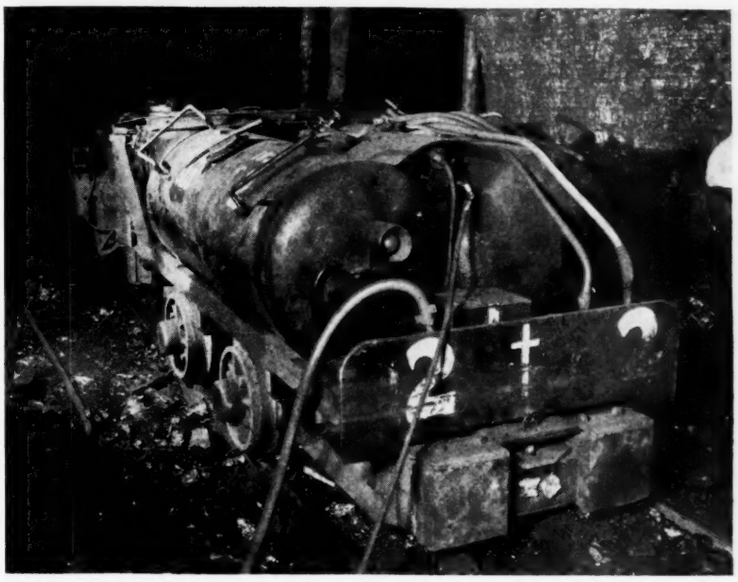
Wire-rope clamps (Laughlin, Crosby, etc.) found widespread use in making permanent and semi-permanent feeder splices and taps last year. Some companies have used rope clamps for this duty for many years, thus furnishing convincing evidence that the traditional admonition to "Solder all joints" is on the way out —and deservedly so.

Rail welding made wide gains in 1940, with Thermit, gas and arc welding sharing the field. At drift mines using the Thermit process, the practice of welding rails into 90-ft. lengths and then taking them inside has substantially reduced costs. This method was used at the Puritan mines in West Virginia in building 7,000 ft. of new main-line track (*Coal Age*, September, 1939, p. 60). At Bankston Creek No. 5, one of the reasons for selecting Thermit welding was ease in joining miscellaneous sizes of the slightly worn relaying rail available.

Motor applications in auxiliary services in 1940 included the use of 450-hp. 2,300-volt General Electric units on three 5,000-g.p.m. deepwell turbine pumps installed by the New River Co. at the top of a 270-ft. shaft sunk at a low point to drain Mabscott, Sprague, Skelton and part of the Cranberry mines. Scattered main pumps will be eliminated and pumping charges materially reduced, along with an increase in efficiency.

Electrical equipment on the new 35-yd. Marion "knee-action" stripping shovel put in service by the Tecumseh Coal Corporation, Dickeyville, Ind., last year has a total horsepower rating of 3,850. It was supplied by General Electric and the controls include the recently developed "Amplidyne" exciter. A 4,000-volt 1,150-hp. synchronous motor drives the variable-voltage d.c. generators. The 150-hp. crowd motor is mounted on the gantry instead of the boom. A knee-action loading shovel with 7½-yd. dipper is equipped with a 250-hp. 4,000-volt induction motor-generator.

Supplementary ground wires were carried in cables supplying stripping units at an increasing number of mines in 1940. At the Millstadt No. 1 operation of the Midwest-Radiant Corporation, Millstadt, Ill., as an example, the 1,300-ft. 4,000-volt cables supplying stripping and loading equipment each include a ground wire, this providing a solid metallic connection from the equipment back to the pole-line lateral and through it on back to the main substation. Although practiced in other fields, the use of "trench-lay"-type cable from lateral to pit equipment was introduced in Kansas in 1940 with an installation at the new No. 18 mine of the Pittsburg & Midway Coal Mining Co., near West Mineral.



Clean, metered delivery of grease and hydraulic oil is assured by this Kings mine lubricating truck.

Last year's installations established 440 volts even more solidly as the standard for motors up to 100 hp. in preparation plants and comparable services. Underground, particularly for conveyor drives, the competition between 220 and 440 continued, with some States prohibiting the higher voltage and others offering no official objection.

In preparation plants, 1940 activities confirmed the trend away from full-automatic sequence control and toward manipulation of each button by the operator. Simplicity and flexibility were the major reasons. Interlocking, however, was the rule to prevent starting a motor out of the correct order and to insure stoppage of

units behind in case one went out of service. One example is furnished by the Millstadt plant, which also was one of several varying feeding rate by an electrically controlled speed-changing mechanism operated from the central plant-control station. Signal lights show the operator whether the mine-run hopper is full or empty, the level of coal in the retail bins, etc., as well as the operating condition of all equipment and points from which operation has been stopped for any reason.

Fluorescent lamps for lighting picking tables were installed in a number of preparation plants last year. Although not generally recommended by manufacturers for this service, results have been satisfactory as a whole and many pickers prefer the white light of the fluorescent units.

Glass Makes Gains

Glass insulation for motors subject to severe heating made gains in 1940, although few company officials would go so far as to say that they had definitely standardized on it for all work or any particular duty. Because a high-grade insulation can be expected to last for years, results are slow to appear, but reports to date are sufficiently favorable to foreshadow a steady increase in use. Improved maintenance, with consequent reduction in the number of cases where windings suffer purely mechanical damage, is another factor which will favor use of a high-quality insulation such as glass.

Instances of maintenance improvements involving extensions to existing shops or the installation of new ones in 1940 included the Koppers Coal Co., which put in two new underground shops to insure better service and quicker repairs to mechanical-mining equipment. Use of welding equipment was expanded, underground as well as on the surface. The Truax-Traer Coal Co., with mines in Illinois, reported that maintenance of equipment in both pits and preparation plants had been improved and the program carried out at a lower cost by the increased use of improved arc-welding methods. "We have added considerably to arc-welding equipment at all of our Illinois mines this past year."

Welding Circuits Used

The Millstadt operation was another in the list of preparation plants making special provisions for welding. The welding machine, mounted on rubber tires so that it also can be taken to the pit and elsewhere and plugged in to convenient receptacles, normally is kept at the shop near by the preparation plant, which is equipped with a separate welding circuit with take-offs at convenient points. Thus, the welding operator, when his services are required in the preparation plant, plugs in to the nearest receptacle without moving or reconnecting the welding machine. Installation of separate arc-welding circuits also was paralleled at several operations by the installation of complete piping systems with outlets for acetylene or both acetylene and oxygen. Similar installations also were made in an increasing number of shops.

Another growing application for welding was the hard-facing of mining-machine bits and the wearing surfaces on mining, preparation and processing equipment. The Lehigh Briquetting Co., Dickinson, N. D., for instance, used hard-surfacing more than ever in 1940, reporting that "economical ways have been found to reduce wear and tear by using the proper surface coat for the different pieces of equipment, such as crusher teeth, sliding chutes, mixer paddles, and the like."

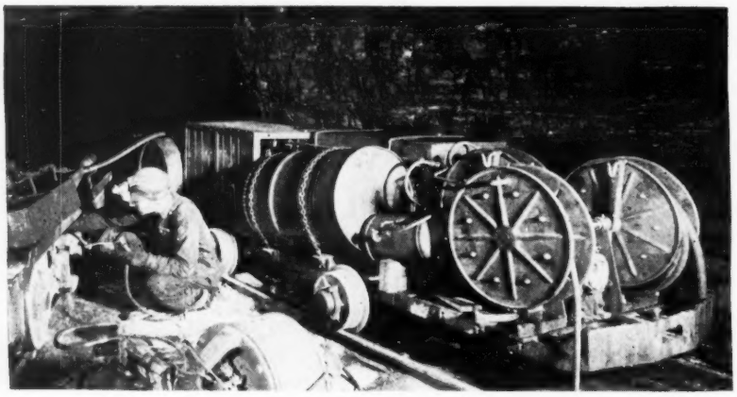
Intensified study of the relation of lubrication practices to maintenance cost and machine operating time resulted in the adoption of greasing trucks, institution of report systems, improved sealing of cases and other practices to increase lubricating efficiency at an increasing number of operations in 1940. As a result, several companies found it possible to materially reduce the consumption of the lubricant previously used or change to one costing less per unit of quantity.

Users of lubricant trucks were divided into two major classes, depending upon whether the trucks were designed to accommodate the original containers or were built with special pressure tanks filled on the surface or at other convenient points. Kings mine of the Princeton Mining Co., Princeton, Ind., was an adherent of the latter practice, operating two trucks each with two welded pressure tanks, one with a bulkhead, thus making it possible to carry not only grease but also two kinds of hydraulic oil.

Greasing Reports Adopted

The trucks are fitted with air compressors and meters and eliminate any possibility of contamination. A high-pressure Alemite gun is installed for pressure fittings. Greasers are supplied with report forms covering all lubricant applications, and their figures are posted in the shop for the guidance of the maintenance head. Frequently, increased use of lubricant has enabled the maintenance department to detect leaking cases or other defects before they were found by the operators or section electricians. Kings lubricating practices will be described in an article scheduled for March publication.

Three hose reels, a pressure tank for oil, space for a drum for special applications, Alemite barrel pumps, meters and a tool box for servicing equipment are installed on the grease truck used by the Linton-Summit Coal Co., another Indiana operation. This company also has instituted an accurate record of lubricant applications, which serves as a guide in overhauls. Clean delivery is a major advantage of the unit, the Linton-Summit organization has found, and reduction in losses already has cut oil consumption approximately in half. There also has been a saving of 30 minutes or more in greasing time per machine.



Hose reels and a tool box are included in the Linton-Summit lubricating truck.

BITUMINOUS PREPARATION

Marks Up Widespread Gains With Stoker Coal Still More to the Front

MECHANICAL cleaning registered another substantial gain at bituminous mines in 1940 as a result of widespread construction of new plants and installation of new equipment. Additional plants rated at 1,000 tons per hour were built or contracted for, while individual mechanical cleaners rated as low as 10 to 15 tons per hour were acquired for individual sizes, usually fines.

Stoker coal and kindred sizes continued to hold first place in preparation, and improvement of this product was responsible for a substantial share of the new mechanical installations. The growing demand for these sizes also was reflected in a major increase in rescreening or crushing and rescreening equipment, including dedusting units, plus greater stress on dustproofing, removal of tramp iron and blending to assure a uniform product.

Stoker to the Fore

The proportion of new plants without mechanical cleaning was further reduced in 1940, although these otherwise were substantially the same with respect to mixing and blending equipment, crushing and rescreening facilities, loading equipment and provisions for dustproofing and tramp-iron removal. In other words, emphasis was laid on stoker and other intermediate sizes.

Full-scale mechanical plants normally cleaned up to 6 in., with one 1940 washing installation going up to 8 in. Some combination wet-and-dry plants were installed, while other operators bypassed small coal around washers. Dry cleaners were chosen for a number of plant additions, many for the finer sizes.

Washington table additions in 1940 included a Deister-Overstrom "Super-Duty Diagonal-Deck" unit for ¼ x 0 at the Northwestern Improvement Co.'s cleaning plant, which now contains three Vissac jigs (3 x ¼) and one American air and two "Diagonal-Deck" wet tables (¼x0) and one Vissac screen-type heat dryer. At the Continental Coal Co. plant, wash water and minus 3/32-in. coal go to a "Diagonal-Deck" table recovering approximately 9 per cent of the output. Smelters form a good market for this coal. Stump "Air-Flow" equipment for 1¼ x 0-in. coal was put in by the Roslyn-Cascade Coal Co.

Improvement of minus $\frac{3}{16}$-in. was the object of new facilities at the Hiawatha (Utah) plant, United States Fuel Co. A Hardinge hydroseparator removes high-ash minus 48-mesh from $\frac{3}{8}$ x 0-in. coal. This 48-mesh material is dewatered in an Eimco filter to permit its disposal with other plant rejects by dump truck, rather than as slurry. The minus $\frac{3}{16}$-in. from the hydroseparator is dried in a Link-Belt "Roto-Louvre" heat dryer, reported to be its first use on material this small.

Preparation activity in other Rocky Mountain States was directed to additions to existing operations to permit mixing, make stoker coal, dedust, etc. Among the new plants was a Robins installation (Eaton Metal Products Co.) at the Clayton (Colo.) mine, Clayton Coal Co., to produce lump, egg, pea, modified pea, slack and combinations. Equipment includes a pick breaker and a 5 x 12-ft. double-deck "Gyrex" screen.

Activities in Iowa and the Southwest included tipple construction and washer installations. In Iowa, the National Coal Co. installed a new 3-track all-steel Link-Belt tipple with a shaking picking table, shaker screen, Symons vibrating degradation screen, Link-Belt double-roll sizer with motor-driven roll adjustment and silo-type storage bin for minus $\frac{3}{16}$-in. (January, 1941, *Coal Age*, p. 50). A complete new tipple also was built by the Dallas Fuel Co.

Improvements in preparation at truck operations were reflected in two Missouri washing installations in 1939 and 1940. The Moberly Fuel Co., as an example, operates a 40-tons-per-hour National Steel Washeries, Inc. (Montgomery), washer for cleaning minus 3-in. coal (January, 1941, *Coal Age*, p. 48), while the Marriott-Reed Coal Co., Columbia, installed a McNally-Pittsburg automatic washer for 3 x 0-in. coal, 60 tons per hour (December, 1940, *Coal Age*, p. 67).

Washer Cleans 6 x 0

A McNally-Norton compound washer for 6 x 0-in. coal was installed in the new Crowe Coal Co. plant at Clinton, Mo., 350 tons per hour, with facilities for classifying to four sizes. At Huntsville, the Templeton-Matthews Corporation put in an Elmore continuous centrifugal dryer for ⅜ x 0-in. coal, 65 tons per hour, for the Huntsville-Sinclair Mining Co.

The new St. Louis smoke ordinance generated several preparation improvements in Arkansas and Oklahoma, such as a new four-track tipple (Excelsior Preparation Plant, Inc.) to permit four eastern Arkansas companies to enter this market. Paris Coal Washery Co., Inc., Paris, built a plant incorporating Leahy "NO-Blind" screens, one "Super-Duty Diagonal-Deck" coal-washing table for 3 x 2-in. coal (16 to 20 tons per hour), one for 2 x ⅞-in. (15 to 18 tons) and two for ⅞ x 0-in. (15 tons).

In Kansas, the Clemens Coal Co.,

Mulberry, installed three Deister "Plat-O" tables for fine coal, along with a "Plato-O" vibrating dewatering screen. Modernization of the Pittsburg & Midway Coal Mining Co.'s plant at West Mineral was another Kansas development. Coal is dumped in a Link-Belt rotary dumper and the 8 x 1¼-in. size is cleaned in a new McNally-Norton automatic washer. Middlings from two McNally-Norton fine-coal jigs are re-treated in an Ore Reclamation Co. round-bottomed Harz-type jig.

All minus ¾-in. coal from the two fine-coal jigs is run to two large horizontal vibrating screens for removal of minus ¼-in. material and water, sluiced to a large classifying and settling tank. Minus ¼ is dragged up an incline and sprayed and dewatered over 1-mm. wedge wire. Refuse from the wedge wire is classified and re-treated on "Diagonal-Deck" tables. "We believe this provides a very flexible arrangement and is particularly adaptable to a coal seam where there is a large percentage of middling product."

Mechanical Plants Installed

Developments in the Middle West included new mechanical plants and additions, such as the 50-tons-per-hour Jeffrey unit washery for 1 x 0 for the Luzerne-Graham Mining Corporation in western Kentucky. At Peru, Ill., the Peru Deep Vein Coal Co. installed in September a "Super-Duty Diagonal-Deck" table treating about 20 tons of 1¼ x ⅛-in. coal per hour, which has increased sale of this size, used in domestic and commercial stokers, "100 per cent to date."

Stoker demand also was back of a Koppers-Rheolaveur crushing and rescreening addition to the Fidelity No. 11 washery of the United Electric Coal Cos. This addition, which handles washed-nut sizes, includes an American Pulverizer Co. ring mill. The Old Ben Coal Corporation added another American "Twin-Dex" pneumatic separator to its No. 14 stoker "Processing Plant," comprising a track hopper for coal up to 3 in. from other Old Ben operations, an American ring mill, ash-board shakers, "Selectro" vibrating screens, two air tables for ¾ x 5/16-in. coal, storage bins and mixing equipment for ¾ x 5/16-in. and 5/16-in. x 10-mesh.

Central State Collieries, Inc., St. David, Ill., installed a new Link-Belt air-pulsated jig and auxiliary equipment to permit washing all coal up to 6-in. The Chicago, Wilmington & Franklin Coal Co., in addition to starting a Jeffrey plant to recover coal from hand-pickings at New Orient, West Frankfort, Ill. (October, 1940, *Coal Age*, p. 134), also put in service a new washing plant, designed by Allen & Garcia, at Orient No. 1. Equipment includes a Jeffrey Baum-type jig for 6 x 7/16-in. coal and Stump "Air Flow" cleaners for minus 7/16, dedusted after cleaning in the original aspirating equipment.

A new mechanical plant at Kincaid (Ill.) No. 7 mine, Peabody Coal Co., rated at 1,000 tons per hour, will comprise a Link-Belt rotary railroad-car dumper, three Link-Belt air-pulsated jigs, five Link-Belt-American air tables, two McNally-Vissac screen-type heat dryers (1¼-in. x 10-mesh coal, 160 tons per hour) and one Elmore continuous centrifugal dryer (minus 10-mesh, 50 tons per hour). An addition to the Delta Coal Mining Co. plant, Carrier Mills, Ill., incorporates screens and a McNally-Norton automatic washer, 300 tons per hour, 3 x 0-in. coal. Delta supplemented existing heat-drying equipment with a Link-Belt addition built around an

New Bituminous Preparation Facilities in 1940 *

Coal Company	Plant Location	Capacity, Net Tons of Feed Per Hour	Preparation Equipment
Alabama By-Products Corporation	Cordova, Ala.	350	McNally-Pittsburg [1]
Allegheny Pittsburgh Coal Co.	New Kensington, Pa.	200	Heyl & Patterson
American Rolling Mill Co.	Nellis, W. Va.	60	Koppers-Rheolaveur [2]
Arkwright Coal Co.	Morgantown, W. Va.	300	Link-Belt
Atlas Coal & Dredge Co.	Bellaire, Ohio	65	Jeffrey [28]
Ayrshire-Patoka Collieries Corp.	Staunton, Ind.	300	McNally-Pittsburg [3] Cent. & Mech. Ind.[4]
Belle-Mead Coal Co.	Glen Morrison, W. Va.	100	Fuel Process [5]
Benedict Coal Corporation	St. Charles, Va.	85	American [6]
Berwind-White Coal Mining Co.	St. Michael, Pa.	120	Heyl & Patterson [7]
Bird Coal Co.	Tire Hill, Pa.	250	Roberts & Schaefer [7]
Black Creek Coal & Coke Co.	Trafford, Ala.	15	Deister Machine [9]
Boone County Coal Corporation	Sharples, W. Va.	480	Link-Belt
W. E. Callahan Construction Co.	Carbon, Ind.	75	Link-Belt
Carbon Fuel Co.	Decota, W. Va.	200	.....
Carter Coal Co.	Juno, Va.	50	Fuel Process [5]
Cedar Grove Collieries, Inc.	Cedar Grove, W. Va.	150	Kanawha
Central State Collieries, Inc.	St. David, Ill.	150	Link-Belt [10]
Chicago, Wilmington & Franklin Coal Co.	Orient, Ill.	800	Allen & Garcia Jeffrey [11] Roberts & Schaefer [13]
Clayton Coal Co.	Clayton, Colo.	300	Robins
Clemens Coal Co.	Mulberry, Kan. (3)	45	Deister Machine [9]
Clinchfield Coal Corporation	Clinchco, Va.	360	Fairmont
	Dante, Va.	175	Fairmont [7]
Clover Fork Coal Co.	Kitts, Ky.	200	Morrow
Consolidation Coal Co.	Acosta, Pa.	100	Fairmont [7]
	Gray, Pa.	50	Fairmont [7]
	Carolina, W. Va.	160	Fairmont [7]
	Shinnston, W. Va.	450	Fairmont [13]
Crab Orchard Improvement Co.	Eccles, W. Va. (2)	80	Fuel Process [5]
Crowe Coal Co.	Clinton, Mo.	350	McNally-Pittsburg [1]
Crozer Coal & Coke Co.	Elkhorn, W. Va.	125	Roberts & Schaefer [7]
Dallas Fuel Co.	Granger, Iowa	100	.....
Delta Coal Mining Co.	Carrier Mills, Ill.	300	McNally-Pittsburg [14]
		26	Link-Belt Cent. & Mech. Ind.[4]
Eastern Coal Corporation	Hardy, Ky.	270	Morrow [7]
Elk River Coal & Lumber Co.	Widen, W. Va.	165	Link-Belt
Excelsior Preparation Plant, Inc.	Hackett, Ark.	300	.....
Glendora Coal Co.	Sullivan, Ind.	200	Templeton-Matthews
Goose Creek Mining Co.	Garrett, Ky.	60	Fuel Process [5]
Gulf Smokeless Coal Co.	Tams, W. Va.	125	Link-Belt
Hanna Coal Co. of Ohio	Dun Glen, Ohio	250	Morrow
	Neffs, Ohio	25	Cent. & Mech. Ind.[4]
	Piney Fork, Ohio	375	Link-Belt [15] Cent. & Mech. Ind.[15]
Harlan Fuel Co.	Yancy, Ky.	400	Jeffrey
Heisley Coal Co.	Nanty Glo, Pa.	125	Roberts & Schaefer [7]
Huntsville-Sinclair Mining Co.	Huntsville, Mo.	65	Templeton-Matthews Cent. & Mech. Ind.[4]
Imperial Smokeless Coal Co.	Quinwood, W. Va.	50	Fuel Process [5]
Ingle Coal Co.	Elberfeld, Ind.	250	Templeton-Matthews[16] Stephens-Adamson [16]
Island Creek Coal Co.	Holden, W. Va.	100	Roberts & Schaefer [17]
Jones & Laughlin Steel Corporation	Pittsburgh, Pa.	400	Koppers-Rheolaveur [18]
Kelleys Creek Colliery Co.	Maidsville, W. Va.	60	McNally-Pittsburg [14]
Lillybrook Coal Co.	Lillybrook, W. Va.	50	Fuel Process [5]
Lindsey Coal Mining Co.	Punxsutawney, Pa.	45	Roberts & Schaefer [17]
Linton-Summit Coal Co.	Linton, Ind.	400	Templeton-Matthews[19] Jeffrey [19] Cent. & Mech. Ind.[19]
Logan County Coal Corporation	Slagle, W. Va.	150	Link-Belt
Loyal Hanna Coal & Coke Co.	Onnalinda, Pa.	285	Link-Belt
Luzerne-Graham Mining Corporation	Luzerne, Ky.	50	Jeffrey [20]
Marianna Smokeless Coal Co.	Pineville, W. Va.	150	Kanawha [21] Link-Belt [21]
	Pineville, W. Va.	150	Kanawha [21] Link-Belt [21]
Marigold Coal Corporation	Jasper, Ala.	200	United Iron Works [29]
Marriott-Reed Coal Co.	Columbia, Mo.	50	McNally-Pittsburg [14]
Mine No. 6, Inc.	Millfield, Ohio	200	Morrow [22]
Monongahela Rail & River Coal Corp.	Maidsville, W. Va.	250	Roberts & Schaefer [8]

Elmore continuous centrifugal dryer for minus 10-mesh material.

Breaking all coal to 6-in. before treatment is the plan at the new mechanical plant of the Ayrshire-Patoka Collieries Corporation, Staunton, Ind. Rated 400 tons per hour, the plant contains two McNally-Norton automatic washers, one a compound unit, with classification into four sizes and blending facilities, as well as an Elmore centrifugal for minus ¼-in.

Two "Air-Sand" cleaners, one for 4 x ⅜- and the other for ⅜ x 0-in. coal, are installed in the new Ditney Hill plant, Ingle Coal Co., Elberfeld, Ill., designed by Templeton-Matthews and including mixing and crushing for stoker coal. The Linton-Summit Coal Co. also contracted with Templeton-Matthews for a mechanical plant for a new mine near Dugger, Ind. Rating is 400 tons per hour and all coal under 6-in. will be cleaned in a Jeffrey Baum-type jig. Complete crushing and rescreening facilities will be provided, with an Elmore centrifugal for minus ¼-in.

An addition to the Kingman (Ind.) plant, F. C. Morgan Coal Co., houses a McNally-Norton automatic washer for 6 x 0-in. coal. A washing addition to the Kings plant, Princeton Mining Co., Princeton, Ind., comprises classifying screens and a Jeffrey Baum-type jig for 6 x ¼-in. coal (minus ¼-in. bypassed).

A Templeton-Matthews plant for the new Julian mine, Standard Coal Co., Frichton, Ind., is supplied with a Jeffrey Baum-type jig, 7 x 0-in. coal, with an Elmore centrifugal for minus ¼-in. Five sizes will be loaded on four tracks. Capacity is 400 tons per hour.

With the 6 x 0-in. washing plant coming into production at the Blaine mine, Lorain Coal & Dock Co., Ohio contracted for new installations in 1940. Hanna Coal Co. of Ohio, in addition to a washing plant for Dun Glen No. 11 (Morrow equipment and structure), contracted for a new Link-Belt washing plant at Piney Fork with Elmore centrifugal dryer. Another Elmore previously had been installed at Willow Grove No. 10 to dry 3/16-in. x 28-mesh.

A new screening and washing plant, 200 tons per hour, was installed by Mine No. 6, Inc., Millfield, Ohio. A Morrow "Multiflow" washer, rated at 115 tons per hour, cleans 3 x ⅜-in. coal.

New Bituminous Preparation Facilities in 1940 *

Coal Company	Plant Location	Capacity, Net Tons of Feed Per Hour	Preparation Equipment
Monroe Coal Mining Co.	Revloc, Pa.	125	Roberts & Schaefer [7]
F. C. Morgan Coal Co.	Kingman, Ind.	150	McNally-Pittsburg [14]
Morris Run Coal Mining Co.	Morris Run, Pa.	100	Roberts & Schaefer [17]
National Coal Co.	Fosterdale, Iowa	150	Link-Belt
Northwestern Improvement Co.	Roslyn, Wash.	14	Deister Concentrator [23]
Oakwood Smokeless Coal Co.	Oakwood, Va. (3)	130	Fuel Process [5]
Old Ben Coal Corporation	Buckner, Ill.	60	American [6]
Page Coal & Coke Co.	Pageton, Pa.	700	Roberts & Schaefer [8]
	Pageton, W. Va.	200	Roberts & Schaefer [7]
Pardee & Curtin Lumber Co.	Bergoo, W. Va.	225	Link-Belt
	Bergoo, W. Va.	240	McNally-Pittsburg [24]
Paris Coal Washing Co., Inc.	Paris, Ark. (4)	50	Deister Concentrator [23]
Peabody Coal Co.	Kincaid, Ill.	1,000	Link-Belt [25] McNally-Pittsburg [25] Cent. & Mech. Ind. [25]
	West Frankfort, Ill.	200	Link-Belt
Peerless Coal & Coke Co.	Vivian, W. Va.	325	Roberts & Schaefer [7]
Peerless Sales Co.	Peerless, Utah	35	Link-Belt [7]
Pemberton Coal & Coke Co.	Affinity, W. Va.	40	Fuel Process [5]
Pennsylvania Coal & Coke Corporation	Cresson, Pa.	100	Link-Belt
	Ehrenfeld, Pa.	400	Fairmont [13]
Perkins-Harlan Coal Co.	Liggett, Ky.	140	Link-Belt [7]
Peru Deep Vein Coal Co.	Peru, Ill.	15	Deister Concentrator [23]
Pittsburg & Midway Coal Mining Co.	West Mineral, Kan.	350	McNally-Pittsburg [14]
Princeton Mining Co.	Princeton, Ind.	450	Jeffrey [26]
Redlands Coal Co.	Glenside, Pa.	150	Roberts & Schaefer [8]
	Sides, Pa.	150	Roberts & Schaefer [8]
Republic Steel Corporation	Sayreton, Ala. (4)	40	Deister Concentrator [23]
Rochester & Pittsburgh Coal Co.	McIntyre, Pa.	425	Heyl & Patterson [7]
	Ernest, Pa.	200 300	Fairmont [13] Heyl & Patterson
Roslyn-Cascade Coal Co.	Ronald, Wash.	15	Roberts & Schaefer [17]
Sheridan-Wyoming Coal Co.	Kleenburn, Wyo.	360	Link-Belt
Slab Fork Coal Co.	Slab Fork, W. Va.	300	Robins
Sloss-Sheffield Steel & Iron Co.	Flat Top, Ala.	15	Deister Machine [9]
Standard Coal Co.	Frichton, Ind.	400	Templeton-Matthews [27] Jeffrey [27] Cent. & Mech. Ind. [27]
Sunnyside Coal Co.	Cumberland, Md.	16	Deister Concentrator [23]
Sycamore Coal Co.	Cinderella, W. Va.	125	Roberts & Schaefer [8]
Tennessee Consolidated Coal Co.	Palmer, Tenn.	16	Deister Concentrator [23]
Union Collieries Co.	Mayfield, Pa.	75	Link-Belt
United Electric Coal Cos.	Duquoin, Ill.	200	Koppers-Rheolaveur [7]
Weirton Coal Co.	Isabella, Pa.	360	Link-Belt
West Virginia Coal & Coke Corporation	Omar, W. Va.	108	Jeffrey [28]

* Also includes installations of preparation equipment in existing structures. Where information indicates that more than one cleaning unit is installed, the number ordinarily is given in parentheses after the plant address.

[1] Including McNally-Norton compound automatic washing equipment. [2] Koppers-Battelle launder. [3] Including one McNally-Norton automatic and one automatic compound washers. [4] Elmore continuous centrifugal dryer. [5] Belknap chloride washing equipment manufactured by Kanawha Mfg. Co.

[6] American "Twin-Dex" pneumatic separator equipment. [7] Crushing or crushing, handling and screening equipment, in many cases for stoker-coal production. [8] Including hydro-separator coal-washing equipment. [9] Deister "Plat-O" coal-washing table equipment. [10] Including Link-Belt air-pulsated jig equipment.

[11] Jeffrey Baum-type coal-washing equipment, 500 tons per hour. [12] Stump "Air Flow" coal cleaners, 175 tons per hour. [13] Including Chance sand-flotation coal-cleaning equipment. [14] Including McNally-Norton automatic coal-washing equipment. [15] Including Link-Belt air-pulsated jig, two screen-type heat dryers and Elmore continuous centrifugal dryer, 36 tons per hour.

[16] Includes two "Air-Sand" coal cleaners. [17] Including Stump "Air Flow" coal-cleaning equipment. [18] Including Koppers-Rheolaveur coal-washing equipment. [19] Including Jeffrey Baum-type jig and two Elmore continuous centrifugal dryers. [20] Jeffrey unit washery.

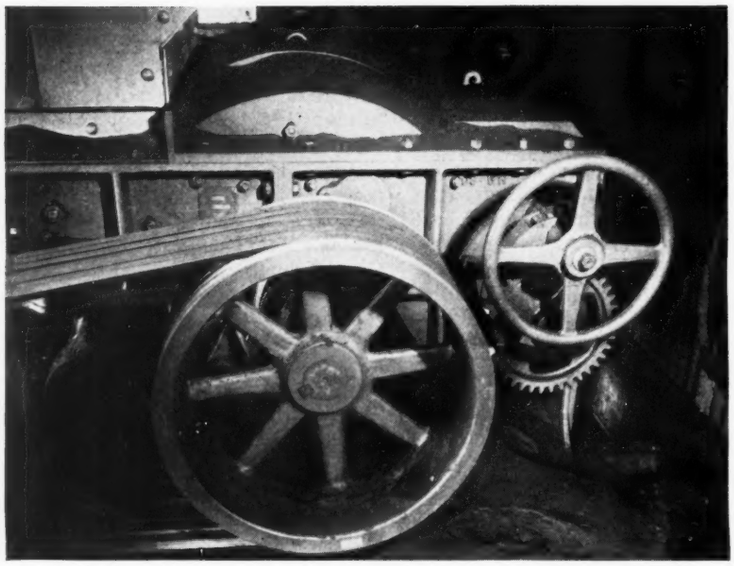
[21] Including Link-Belt air-pulsated jig, 150 tons per hour. [22] Including Morrow "Multi-Flow" washing equipment. [23] Deister-Overstrom "SuperDuty Diagonal-Deck" coal-washing table equipment. [24] Breaking and screening equipment, including McNally-Norton pick breaker. [25] Including Link-Belt rotary railroad-car dumper, three Link-Belt air-pulsated jigs, five Link-Belt-American air tables, two McNally-Pittsburg Vissac heat dryers (160 tons per hour) and one Elmore continuous centrifugal dryer (50 tons per hour).

[26] Including Jeffrey Baum-type coal-washing equipment. [27] Including Jeffrey Baum-type jig and one Elmore continuous centrifugal dryer. [28] Including Jeffrey diaphragm-jig coal-washing equipment. [29] Including Ore Reclamation Co. jig washer.

Crushing Units Increase

Additions to Pennsylvania plants included such items as Heyl & Patterson picking equipment, Indianola plant, Alleghany-Pittsburgh Coal Co., and Link-Belt extensions, Loyal Hanna Coal Co. plant, Cairnbrook. Demand for smaller sizes was reflected in a number of crushing and screening installations, such as the Fairmont equipment for secondary crushing to ¾-in. at Acosta and Gray, Consolidation Coal Co.; Heyl & Patterson crushing equipment at St. Michael, Berwind-White Coal Mining Co. (6- to ¾-in.) and screening and crushing equipment for Kent Nos. 1 and 2, Rochester & Pittsburgh Coal Co., with provisions for loading 3½ x 2 egg, 2 x ¾ stoker and ¾ x 0 slack; and Roberts & Schaefer installations, Bird Coal Co., Tire Hill (lump to 1¼-in.) and the Heisley and Monroe companies (lump and egg to 1¼-in.).

Among Pennsylvania mechanical-cleaning installations was Stump "Air-Flow" equipment for the Lindsey Coal Mining Co., Punxsutawney (½ x 0) and the Morris Run Coal Mining Co., Morris Run (¾ x 0).



Increased demand for stoker coal stimulates crushing and rescreening installations.

New Roberts & Schaefer tipples, each 150 tons per hour, with hydroseparator coal-washing and crushing equipment for 3 x 1¼-in. egg, 1¼ x ⅜-in. stoker and ⅜ x 0-in. slack were built at the Nos. 9 and 11 mines, Redlands Coal Co., Sides and Glensides, Pa. A Koppers-Rheolaveur washing plant was added to Jones & Laughlin Steel Co. facilities at Pittsburgh, Pa.

The Pennsylvania Coal & Coke Corporation installed a Fairmont washing and screening addition to its Erhenfeld No. 3 plant. Cleaning of 4¼ x ⅜-in. coal is done in a Chance sand-flotation cone (United Engineers & Constructors, Inc.). Minus ⅜-in. coal is bypassed. Primary screening is done on a double-deck Gyrex screen. Cleaned coal is classified on shakers. Lump may be broken down in a McLanahan & Stone crusher and added to the cone feed. A Chance cone also went into a new cleaning plant of the Rochester & Pittsburgh Coal Co., Ernest, Pa.

West Virginia Active

West Virginia was active in both plant additions and construction of new operations. Additional tonnages of small coal and improved screening of smaller sizes were objectives in crusher installations at six plants and extension of screening facilities at four in that and other States by the Koppers Coal Co. Koppers also installed two more layer-loading hoists and two coal-testing laboratories.

Companies adding to dumping and screening equipment (Link-Belt) included the Arkwright Coal Co., Morgantown, and the Gulf Smokeless Coal Co., Tams. A grizzly was installed ahead of the hopper at No. 9 mine, Carbon Fuel Co., Wevaco, to permit better inspection and picking of plus 1¼-in. coal. The company also opened No. 9-X mine, an exact duplicate of its No. 7 (*Coal Age*, April, 1939, p. 51), even to a 300-ton storage tank ahead of the tipple. Both are being equipped with Merrick "Weightometers" to check tonnage payments.

Crushing and screening installations also were made by the Consolidation Coal Co., Carolina (2 x ¾ to minus ¾, Fairmont design); Page and Crozer coal and coke companies, Pageton and Elkhorn (Roberts & Schaefer installations to reduce 3 x 0-in. coal and screen it to ¾ x ⅜ and ⅜ x 0); and the Peerless Coal & Coke Co., Vivian (Roberts & Schaefer, lump and egg to minus ⅝, screen to ⅝ x ¼ and ¼ x 0). Pardee & Curtin Lumber Co., Bergoo, installed a McNally-Norton pick breaker for plus 4-in. coal.

New West Virginia tipples included the Logan County Coal Corporation, Slagle (Link-Belt), and Cedar Grove Collieries, Inc., Cedar Grove (Kanawha). River-loading facilities were incorporated in the later operation.

West Virginia installed a number of cleaning units for specific sizes, such as a Koppers-Battelle launder, American Rolling Mill Co., Nellis, 5/16 x 0; Jeffrey diaphram jig with dewatering screens and "Flextooth" crusher, No. 5 mine, West Virgina Coal & Coke Corporation, Omar, 3 x 1¼; Stump "Air-Flow" equipment, Mine No. 20, Island Creek Coal Co., Holden, 1¼ x 0; hydroseparator, Sycamore Coal Co., Cinderella, 3 x 0, screening to 3 x 1, 1 x ⅜ and ⅜ x 0; hydroseparator and revisions to tipple, capacity 700 tons per hour, Page Coal & Coke Co., Pageton, 6 x 1¼ washed, sizing equipment for lump, 6 x 3, 3 x 1¼, 1¼ x ⅝, ⅝ x ¼ and ¼ x 0; additional McNally-Norton automatic washer, Kelleys Creek Colliery Co., Maidsville, 5 x 0; and Belknap chloride washers as follows: Belle-Mead Coal Co., Glen Morrison, stove; Crab Orchard Improvement Co., Eccles, 7 x 2 egg, 2 x ⅝; Imperial Smokeless Coal Co., Quinwood, stove; Lillybrook Coal Co., pea.

Hydroseparator equipment for 5 x ⅜-in. was incorporated in the new Roberts & Schaefer plant for the Monongahela Rail & River Coal Corporation, Maidsville. Provision is made for breaking lump to 5-in. after picking.

Kanawha plants with Link-Belt air-pulsated jigs were selected for the two new mines of the Marianna Smokeless Coal Co., Pineville. A Fairmont washing addition for No. 32 mine, Consolidation Coal Co., Shinnston, comprises a 13½-ft. Chance cone for 5 x ⅜ coal, two-stage crushing, stoker and slack screening and blending and 5-track boom loading facilities, plus other auxiliaries.

More Crushing Done

Eastern Kentucky and Virginia companies added to crushing and rescreening facilities. Belknap chloride washers were adopted by the Goose Creek Mining Co., Garrett, Ky.; Carter Coal Co., Juno, Va., 3 x 1¼; and the Oakwood Smokeless Coal Co., Oakwood, Va., 3 x 1¼, 1¼ x ¾ and ¾ x ¼. Benedict Coal Corporation, St. Charles, Va., installed an American "Twin-Dex" pneumatic separator for 2½ x 0 coal.

Tipple revisions by the Harlan Fuel Co., Yancy, Ky., included new primary shaker screens, six Jeffrey-Traylor vibrators, Jeffrey "Flextooth" crushers and auxiliaries. A Link-Belt sizer was installed by the Perkins-Harlan Coal Co., Liggett, Ky. Fairmont crushing and recirculating equipment was added at No. 52 mine, Clinchfield Coal Corporation, Dante, Va. Morrow crushing and rescreening plants were installed by the Clover Fork Coal Co., Kitts, Ky. (6 x 0), and the Eastern Coal Corporation, Hardy (2 x 0).

Tennessee and Alabama organizations installing coal-washing tables

included the Tennessee Consolidated Coal Co., Palmer, Tenn., "Super-Duty Diagonal-Deck" unit for ¾ x ⅛-in. coal, and the Republic Steel Corporation, Sayreton, Ala., four similar units to treat bony jig middlings. Black Creek Coal & Coke Co., Trafford, Ala., acquired a "Plat-O" table for ¼ x 0, with another to the Sloss-Sheffield Steel & Iron Co., Flat Top, Ala., for a ¼ x 0-in. hutch product.

A McNally-Norton automatic compound washer for 3 x 0-in. coal, together with new elevators, screening plant and other auxiliaries, 350 tons per hour, was installed at the Barney mine, Alabama By-Products Corporation, Cordova, Ala. A plant serving the new Marigold Coal Corporation stripping, Jasper, Ala., was equipped with an Ore Reclamation jig unit.

Increased use of conveyor-equipped settling tanks marked developments in wet washing in 1940. At the Pyramid Coal Corporation, Pickneyville, Ill., an auxiliary settling tank up in the plant receives water from the coarse-coal dewatering screens, which is separately recirculated to the coarse-coal washers, saving pumping head and power.

Screen Dewatering Rises

Vibrating screens with special cloths came into increasing use for dewatering. Two horizontal "Selectro" units with 10-mesh cloth, preceded by fixed sieves, are used in the C. W. & F. New Orient washer. Surface moisture in the coal onto the screens (minus 1¼-in.) is 12 to 15 per cent, which is reduced to 4 to 5 per cent. Bixby-Zimmer round-wire screens were applied to a number of high-speed shaker-type dewatering screens. At the Streamline plant, Southwestern Illinois Coal Corporation, Percy, Ill., such screens replaced wedge wire and "gave better dewatering and less loss of coal." At the Pyramid plant, about twice as much ½-mm. material is retained in the dewatered coal, while its moisture content is 3.25 per cent lower.

Centrifugal dryer installations, as noted previously, were installed for ⅜-in. down to 10-mesh. Recovery and cleaning were additional functions in the 10-mesh units, as at Delta, where tests (Elmore unit) showed a recovery of 75 per cent. Average feed ash was 18 to 19 per cent; average ash of the recovered material was 12 to 13 per cent.

Continued research at the Fiatt Red Ember plant, Truax-Traer Coal Co., two McNally-Vissac screen-type heat dryers (*Coal Age*, October, 1939, p. 47), has enabled production of ¾ x 0 with no surface moisture and a coal temperature leaving the equipment of 85 to 90 deg. F.

A substantial growth in dustproofing was another 1940 development. Three oil-treating plants, as an example, were installed by the Koppers Coal Co., with five more under construction. Petroleum or petroleum-chemical products are used in practically all cases. Either oil or calcium-chloride, however, is employed by the Lake Superior Coal Co. and the New River Co., southern West Virginia. Wax and "Waxol" users include Southwestern Illinois and the United States Fuel Co., Utah. Dustlix users include Big Bend Collieries, Inc., in Indiana. The Colorado Fuel & Iron Co. employs oil for dustproofing and "Chemacol" for improving combustion efficiency.

Hot application of oil or wax, using Viking or other heating equipment, is the rule at the majority of coal-preparation plants, although some, such as the Kemmerer Gem Coal Co., Virginia, and the Sahara Coal Co., in Illinois (Brown-Fayro equipment), apply low-viscosity cold oil under high pressure. Oils for hot application normally range from 300 to 600 seconds, although the trend toward heavier products was more noticeable in 1940. The Fiatt Red Ember and Burning Star plants of Truax-Traer (Viking equipment) use 1,500- to 2,000-second oils on all sizes up to 6-in. These have given particularly good results on the Fulton County (Ill.) coals at Fiatt, which are difficult to oil-treat satisfactorily and economically, especially when heat-dried. The high viscosity reduces penetration, in turn cutting consumption and insuring permanency.

Dustproofing is particularly marked in the case of stoker coals, although its application to other sizes is increasing. Some operators also rely on oil for some protection against freezing of coal. The majority, however, depend upon calcium chloride—usually the flake type—for this job. Some plants have installed feeders to insure uniform application and economy in use.

Trademarking Up

Trademarking showed an increase in 1940, with identification of quality stoker products as the motivating force in a number of instances. Stoker produced in the Old Ben "Processing Plant," for example, is trademarked by feeding into it a certain proportion of pieces coated with a green lacquer. Larger sizes are trademarked with a green dye. Scatter tags identify the Kemmerer Gem Coal Co.'s stoker, and this same system is followed by a number of other companies, including Sahara and the Clover Splint Coal Co., for this and other smaller sizes. At Peabody mines, special machines feed disks into the coal. At others, such as the Zeigler (Ill.) operation, Bell & Zoller Coal & Mining Co., "Dustlix" machines place gummed labels into shipments. Another type of "Dustlix" unit at Zeigler presents gummed labels which are placed on lumps by hand. Paper stickers are used by the Colorado Fuel & Iron Co., while in

Examples of trademarks used in identifying coal shipments. Such identification increased in 1940.

Illinois the Mt. Olive & Staunton Coal Co. trademarks larger sizes by pasting on labels with hot starch after cars are loaded. Applying labels in the booms, it has been found, results in too much mutilation during loading. "If a sufficient number of labels are put on the coal over the top of the car the distribution is good after cars are unloaded and the labels are dry."

Chemicals for allaying dust and improving working conditions in preparation plants made gains in 1940, with installations including the two tipples of the Lake Superior Coal Co. and the Dehue (W. Va.) plant, Youngstown Mines Corporation, a subsidiary of the Youngstown Sheet & Tube Co. ("Sealtite").

In Texas, the Consumers Lignite Co., at Alba, embarked on a briquetting program, which it states "nearly doubles the B.t.u." Burning qualities are good, "making the lowly lignite into a really fine, clean, almost smokeless and clinkerless fuel," which ignites easily, holds fire well, and is free from dust and smudge. The company evolved its compression process to insure a hardness "far above the average." Average number of briquets per ton is 16,000, and the trade name is "Old King Coal Briquets," although the popular name is "Lignite Biscuits."

RESEARCH INDICATES

That Coal and Even Its Wastes Can Supply Many and Varied Industrial Needs

PROSPECTS for activity in coal research seem brighter in 1941. Illinois dedicated its $550,000 Natural Resources Building at Urbana, Nov. 15, 1940, and erected the Illinois Geological Survey Laboratory at a cost of about $80,000. West Virginia also broke ground for its Mineral Industries Building, Oct. 18, with the promise that the structure will be ready this year. The program of Bituminous Coal Research, Inc., will be revived on a three-year basis. Meanwhile, there has been no let-up on smaller projects or in the activity of the U. S. Bureau of Mines.

St. Louis' determination not to tolerate any more coal smoke clearly put the problem of smokeless combustion before the State of Illinois for solution, and Illinois Geological Survey Laboratory was the prompt answer. Immediate objectives are the commercial manufacture of a smokeless briquet made by impact and without binder, and the smokeless combustion of Illinois coal. The briquetting machine is nearly complete; an invertible grate has been designed and constructed for hand-fired domestic furnaces, and it is now being tested.

All the coals from lignite to anthracite are being studied for use as activated carbon, with favorable results. Its use for decolorizing and deodorizing water and other materials is being evaluated. Fly ashes from the burning of pulverized coal may be used in portland-cement mixtures without detriment and in many ways quite helpfully. Coal wastes may be used for agriculture and may be blown into a glassy fiber known industrially as rock wool and used for heat insulation. New slants on safety were developed.

Mineral, or rock, wool has been made by the Mellon Institute of Technology from anthracite waste. The carbonaceous material in the refuse is used to melt the incombustible to a white heat and turn it into a stream of molten material. This stream, escaping from a cupola, is attacked by a stream of air or steam which converts it into fine interlaced threads or hairs to serve as heat insulation. Limestone sometimes, however, has to be mixed with the waste as a flux. This research project is sponsored by Anthracite Industries, Inc. (*Coal Age* June 1940, p. 90). Market for such wools in 1939 was $9,059,299.

Lignite and subbituminous coal are regarded as likely material for gas-absorption carbons and as a catalyst base. Studies of the possibility are being made cooperatively by the University of North Dakota and the U. S. Bureau of Mines. Density of chars can be controlled over wide limits by treating the coal chemically before carbonization, and carbons have been made which have almost as great a capacity as coconut carbons.

Use of coal for purifying sugar and other materials is not new, but tests of the U. S. Bureau of Mines nevertheless are interesting. The richer part of coal-mine refuse, says I. C. 7143, has been made successfully on a laboratory scale into a carbon which will decolorize sugars as completely as the better commercial grades of color carbons. Moreover, judging from the phenol-absorption

test, an activated carbon for water purification made from this same fraction, should remove odor and taste from water as effectively as the better grades of water carbons.

Extensive tests of activation of refuse by zinc chloride produced a more active carbon than steam activation. The best carbon had a phenol number of 18, as compared with 23, the minimum number by the steam process, which is significant, for the lower the phenol number, the greater activity of the carbon, and a phenol number of 30 is specified as the upper limit for a good commercial carbon.

Another Bureau of Mines study (R.I. 3516) has been to ascertain the value of coal-mine waste for darkening soil so that less heat will be reflected from the ground to growing vegetation under a scorching sun. Some plants become burned by the reflection of the sun's rays. By darkening the soil also, its temperature is increased, which in the spring advances growth materially. The waste should be mixed with the soil or rains will segregate it.

Water from the Lost Creek washer in Alabama was found just as helpful to the growth of corn as distilled or creek water in soil cultures. Washer sludge had little or no influence on growth, but when added to a sandy soil, growth of corn increased. Adding 600 lb. of acid phosphate per acre to the soil, the growth of corn was doubled when coal waste was used, but was only slightly increased when the same quantity of fertilizer was applied without mine waste.

Ash as Cement Ingredient

Portland cement has been blended with fly ash, obtained from pulverized-coal furnaces. With such a mixture, concretes are produced with qualities equal and, in some ways, superior to those containing only standard portland cement, because fly ash has a high degree of puzzolanic activity, declares R. E. Davis, consulting engineer, in reporting, to the Research Corporation, results he obtained at the University of California. He found the mix (1) gave a lower compressive strength at first but substantially higher strength later under normal moist curing conditions, (2) showed substantially higher compressive strength after 28 days when the curing temperature was 100 deg. F., (3) shrank no more than normal cement and sometimes less, (4) developed less heat when mixed with water, (5) offered same or less resistance to freezing and thawing, (6) was more resistant to sulphates, and (7) was ultimately less permeable.

For ordinary construction, such fly ashes may be used to replace portland cement up to 30 per cent without in any way impairing the concrete, and in heavy construction as much as 50 per cent may be used with lowered heat of hydration and increased compressive strength.

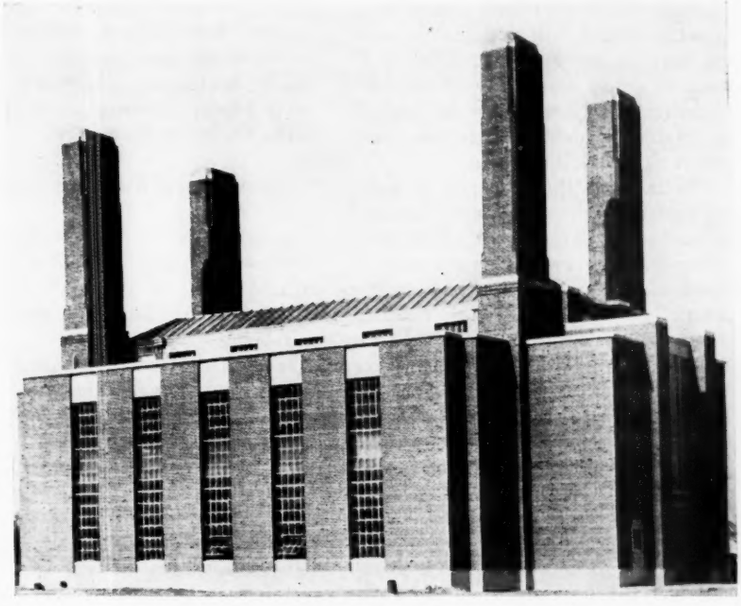
No studies have been made with more than 17 per cent of carbon in the fly ash or with more than 20 per cent of such fly ash in the cement, but high-carbon content in fly ash is not detrimental to the weathering resistance of concrete. All fly-ash portland-cement concretes had after a year substantially higher strength than straight portland-cement concretes and only two had a lower strength after seven days.

All samples of anthraxylon and translucent attritus, says the U. S. Bureau of Mines, on hydrogenation, will liquefy readily and almost completely if they contain less than 89 per cent carbon. This includes those constituents appearing in fuels ranging from peat to high-volatile bituminous coals. The latter boundary, however, is a little hazy. It was found desirable that subbituminous and lignitic coals should be hydrogenated at higher pressures and lower temperatures than was used for the higher-rank coals. Of opaque attritus, 40 to 80 per cent, and of hand-picked fusain, 5 to 30 per cent will liquefy on hydrogenation.

Motor fuel, says the Bureau, can be produced from coal by hydrogenation or by synthesis at an estimated cost of 16 to 18c. a gallon. Total possible yield of benzol from the conversion of coal to coke in 1937 would have equaled only 0.7 per cent of that year's production of gasoline. Had all the bituminous coal mined in 1937 gone to byproduct or to low-temperature ovens, only 4.6 and 4 per cent respectively of that year's gasoline production would have been displaced by the benzol. So, unless coal is hydrogenated, the quantity of oil derived from coal always will be too small to meet our needs.

Western coals are, in many instances, not only of lower rank than most Eastern coals but, as R.I. 3498 indicates, are derived from an entirely different type of vegetation. The West had plants and grasses like those we have today and especially sequoias, cypresses, yews, red cedars, white cedars, pines and firs containing much resin.

They usually are relatively free from opaque attritus and fusain (mineral charcoal), but the Bureau is not ready to declare this a condition sure to be found in all Western lignites. As these two constituents are hydrogenated with great difficulty, their absence is an advantage. "If, as it appears," declares the monograph, "these coals are predominantly of the bright type, the coal deposits in the Western States alone can be considered an important potential source of vast quantities of liquid



New Illinois Geological Survey Building

fuels, phenols, aromatic solvents and other organic chemicals."

On the basis of studies made by the Bureau (I.C. 7109) at the Experimental Coal Mine on 22 samples of mine dust with coals containing from 8 to 31 per cent of volatile matter and from the records of 67 explosion disasters in which 1,829 lives were lost, the Bureau has concluded that all mines with such coal should be rock-dusted as thoroughly as if the coal had a relatively high volatile content. The coal may not be exploded so readily, but, if it does explode, the violence is as great as if the volatile content were higher. A review of current practice shows that when the mines are properly rock-dusted the cost is 0.89c. per ton of coal mined or 2.29c. per linear foot of entry.

Salt Aids Rock Dust

Salting rock dust has not shown results as favorable as in Great Britain. When salt is used in admixture with limestone and coal dust in increments of 5 per cent, the first increment is about six times as effective as limestone, the second only 3.5 times, the third only 2.5 times, and the fourth and fifth are only twice as effective. A cheap grade of unpurified salt was used, because otherwise it could not compete in cost with rock dust. Ground to requisite fineness, the cheap salt absorbed much water in humid atmospheres.

In 13 days, a dust containing only 5 per cent of salt would become as ineffective as a dry dust. Salt to be substituted for rock dust should be so treated that it will not absorb water so long as the humidity at 50 to 60 deg. F. is less than 95 to 98 per cent. Another objection to the use of salt is that rock dust reflects less light when salt is added.

To increase the tendency of water to pass through narrow openings and spread itself over areas of coal or other mineral, wetting agents may be used. They are said to "make water wetter" but they also "make it drier," for it will run away as readily as it enters if opportunity is given for movement unless fixatives are added or naturally present. The Bureau of Mines has been studying one of these wetting agents in the Experimental Mine.

In one test the dust was premixed with the wetting solution, and in the other the dust was placed first along the floor of the test zone and then sprayed with solution. In both cases the dust was so dried by the mine ventilation that only the wetting agent remained in the dust, the quantity of which ranged from zero to 1.6 per cent by weight of dust.

When the wetting agent, a brownish syrupy liquid, was sprayed on the dust in place, a $\frac{1}{8}$-in. crust formed, but none appeared when agent and dust were premixed. The crust, however, proved to be entirely unable to hold down the dust against the forces in an explosion and flame propagated through the dust as much violence as in testing untreated coal dust. The Bureau declared, however, that wetting agents can extend the life of rock-dusting by dispersing the dust clouds before they reach the rock dust (I.C. 7131).

Conclusions of the U. S. Bureau of Mines (R.I. 3508)) with regard to the use of diesel engines underground are that: (1) adequate ventilation must be provided if exhaust gases from these engines are to be discharged in underground working places; (2) that carbon dioxide, carbon monoxide, oxides of nitrogen and oxides of sulphur (from fuel with sulphur content) are dangerous constituents of the exhaust; (3) that diesel engines should not be operated at fuel-rich-air ratios because they then will contain high concentrations of carbon monoxide and soot. Because they are used in Europe, declares the Bureau, is not evidence that they can be safely used in the United States where larger units are required. Conditions are hazardous when the intake mixture contains more than 1 per cent of carbon dioxide or less than 19 per cent oxygen; hence diesel engines should be excluded from sections of mines where ventilation might be inadequate locally, or where exhaust gases might return to the engine.

Cushioned-Blasting Tests

Gallery tests of cushioned blasting disclosed marked evidences of increased risk of ignition with two types of plugs. But these studies are still being continued.

Tests made by the U. S. Bureau of Mines on a high-grade anthracite show that the relative quantities of gases evolved when air is passed through the coal at various elevated temperatures vary with those temperatures, so by analyzing the gas from an area that cannot be approached, the temperatures of the anthracite may be determined before a dangerous fire hazard exists.

In its studies of the reactivity of solid fuels, the Coal Research Laboratory at the Carnegie Institute of Technology has heated samples of coal or coke at a predetermined rate, either in air or oxygen, to determine the point (designated by the temperature) at which the sample and the furnace are equally hot, and this is termed the "ignition point." The rate at which the temperature of the sample is rising at this point is then ascertained. It is the temperature at which the sample ceases to *take* heat *from* the furnace and is about to begin to generate so much heat that it can *give* heat *to* the furnace.

Ignition Point Defined

In the past, the "ignition point" has been variously defined. Probably this is the best approach available to a satisfactory definition, but, as the experimenters recognize, the fuel must have been providing heat prior to arriving at this so-called ignition point, for before that time it had a lower temperature than the furnace, though the difference was constantly getting smaller and smaller.

In general, the higher the content of the volatile matter in the coke, the more reactive it is. Small additions of inorganic compounds, especially sodium carbonate, increase the reactivity of high-temperature cokes. The nature of this catalytic action is being more closely investigated by the Coal Research Laboratory, and recent work indicates that a low-temperature coke which is more reactive than high-temperature coke is not affected by the addition of sodium carbonate; further work is in progress to determine if this is generally true.

Tests made at the Hell Gate station of the Consolidated Edison Co. by the Coal Research Laboratory, the Consolidated Edison Co., Bituminous Coal Research, Inc., and the Pittsburgh Coal Co. showed that the structure of underfeed-stoker fuel beds was quite different from what combustion engineers hitherto had assumed. As a result of this work, improvements in underfeed stokers have been conceived, and patent application made accordingly.

With a Pittsburgh-seam coal and an Illinois No. 6 coal, the samples being closely sized and floated at 1.29 gravity, the following conclusions, based on new experimental data, appear tenable regarding the burning of pulverized coal: (1) The higher the furnace temperature, the longer

the particles remain incandescent; (2) as might be expected, rate of burning, as analyses of the residues show, does not decrease with increase in furnace temperature as some have averred; (3) under the experimental conditions, combustion is incomplete but it reaches a higher degree of completion, the higher the temperature; (4) at lower temperatures, ignition of volatile matter is delayed and may even fail completely; (5) on increasing the cloud densities, the escaping volatile matter forms a continuous combustible medium which supports a definite flame front.

An apparatus recently has been constructed by the Coal Research Laboratory in collaboration with the Bureau of Mines for studying the flow patterns of stationary flames by means of stroboscopically illuminated aluminum particles introduced into the gas stream. This should ultimately aid in better furnace design, for, though about half the weight of coal actually burns as gas, the reactions in the gas phase are still meagerly understood.

Anthracite Industries Laboratory in 1940 announced its draft throttle which, upon having its action started by hand, continues to function thermostatically, providing a single point of control for domestic furnaces with assurance of scientific banking and correct operation. A thousand models of a semi-final unit were constructed and installed on hot water and steam plants, and from these favorable combustion reports have been received. Similar controls for warm-air furnaces are being studied.

With the Federal Housing Authority, the laboratory announces the development of a compact, attractive, enameled cook stove which not only cooks the family meal but includes a 60,000-B.t.u. hot-water-heating boiler and a water back for service water. At least one manufacturer is ready to go into production.

The Koppers Co. has been studying the effect of mixing oil with coal prior to carbonization and finds that it increases the gas product of the oven, which is desirable, for more oil needs to be used in the winter to prevent freezing and concurrently more gas is often needed in winter than the plants can produce. However, more oil may be added in such cases than is necessary to prevent freezing.

Cleaning 150 gal. of slurry a minute by a pilot flotation plant at Gorgas, Ala., under the U. S. Bureau of Mines' direction (R.I. 3458) produced a coal which was 50 per cent fusain, that material in the coal being so crumbly that much or all of it was found in the fine sizes.

Starchy materials, such as potato starch, wheat flour and corn starches, were shown to be effective flocculants by the U. S. Bureau of Mines at the Northwest Experiment Station, but their range of concentration usually is narrower than that of electrolytes, but with the latter satisfactory flocculation is obtained only under a higher degree of concentration. Electrolytes are more effective than starches in flocculating shale, but some may be objectionable in use. Slurries containing flocculated coal filter much more rapidly than those in which the coal is unflocculated.

Studies made by the Battelle Memorial Institute show that when horizontal and vertical currents of water are maintained in proper relationship in a classifier, the concentration is accurate. Not all types of fine coal are amenable to this method of treatment, but where it is applicable, the classifier becomes an efficient low-cost cleaning unit. Investigating the removal of pyrite from fine coal, the institute has used various pyrite depressants on a flotation circuit containing clay slime, endeavoring to form a brittle froth which will float coal free of pyrite.

At the University of Illinois, H. F. Johnstone will test with a model stack, for the Utilities Research Commission, the possibility of using a wet cyclone in the base of the stack to remove simultaneously both dust and sulphur dioxide.

Coal Research in Progress or Completed in 1940 Or Planned for 1941

Air Pollution: Smoke Abatement

Removal of Sulphur Dioxide and Flue Dust From Stack Gases*, Univ. of Ill. with Utilities Research Com. of Chicago.° Eng. Exp. Sta. Bull. 324.
Smoke Abatement, Including Fly-Ash and Sulphur*, U. S. B. M.

Ash and Clinker Formation

Composition of Atmosphere Surrounding Ash Cones in Standard Determination of Softening Temperatures of Coal in Operation of Gas Furnace With Various Gases*,
Effect of Mixing of Coals on Fusibility of Ash*, Northern States Power Co.
Free Fusible Material in Coal Ash*, Fuel Eng. Co. of N. Y.°, A. I. M. E., Proc., Vol. 139, p. 364.
Fusion Temperature of Ash of Kansas Coals*, Univ. of Kan.
Fusion Temperature of Coal Ash and Slag With Special Reference to Reducing and Oxidizing Conditions*, B. & W. Co.°, A. S. M. E. (Dec. 2–6, 1940).
New Testing Method for Ascertaining Fusibility of Coal Ash, Ohio State Univ.
Relation of Ash-Fusion Temperatures of Coal and Coke, U. S. B. M.°, R. I. 3505.
Removal of Ash as Molten Slag From Powdered-Coal Furnaces*, U. S. B. M.
Viscosity of Coal-Ash Slags, U. S. B. M.

Chemical Tests of and With Coal

Analyses of American Coals*, U. S. B. M.
Atmospheric Oxidation of Coal at Moderate Temperatures, U. S. B. M.°, R. I. 3504; I. & E. C., Ind. Ed., Feb., 1940, p. 249; April, 1940, p. 548.
Chemical Tests With Coal and Its Banded Ingredients* (1939), Ill. G. S.‡, Jour. of A. C. S., about Feb., 1941 (Oxidation of Coal and Coal as Oxidizing Agent).
Classification of American Coals*, U. S. B. M.
Coal Oxidation and Solution*, Penn State.
Determination of Organic Sulphur in Combustible Gas*, Standard Oil Co.°, I. & E. C., Anal. Ed., Dec., 1940, p. 724.
Determination of Sulphur in Coal & Coke†, Fuel Eng. Co.°, I. & E. C., Anal. Ed., Dec., 1940, p. 718.
Determination of Surface Oxidation* (1939), Carnegie Tech.
Extraction of Natural and Artificial Coals With Solvents*, Carnegie Tech.°, I. & E. C., Ind. Ed., Oct., 1940, p. 1389; Dec., 1940, p. 1605.
Methods of Analysis of Coals*, U. S. B. M.
Nature of Moisture in Coal (1936), Ill. G. S.‡; to be published I. & E. C. about Feb., 1941.
Oxidation of Coal by Alkaline Permanganate*, Carnegie Tech.
Oxidation of Fusain, Anthraxylon, Opaque Attritus and Coal Resins* (1934), Carnegie Tech.
Specific Heat of Coal*, Penn State.
Statistical Studies of Ultimate Analyses of Illinois Coals†, (1940), Ill. G. S.°, Jour. of Econ. Geol., Nov., 1940.
Thermal Value Nomograph for Anthracite, Wayne Univ.°, I. & E. C., Ind. Ed., Dec., 1940, p. 1651.

Carbonization and Distillation

Blending of Coals for Coking and Effect of Fluidity Characteristics of Individual Coals on Quality of Coke Obtained From Blend*, A. G. A., U. S. B. M., H. C. Porter.
Carbonization of Coal-Oil Mixtures, Koppers Co.°, A. G. A.
Carbonization of Subbituminous Coals and Lignite*, U. S. B. M.
Cracking Coal Tars and Distillates*, Universal Oil Products Co.°, I. & E. C., Ind. Ed., Jan., 1940, p. 39.
Effect of Admixtures of Oxidized Coals in the Blends for Oven

Charges as Inerts to Improve Quality of Coke From Highly Liquid High-Volatile Coals*, H. C. Porter.
Effect of Conditioning Coal on Its Coking Properties*, U. S. B. M.
Effect of Temperature and Other Conditions in Oven Tops on Light Oil and Especially Toluol Yields†, H. C. Porter.
Effects of Certain Inorganic Materials on Coal-Tar Distillation Products*, W. Va. Univ.
Electric Furnace for Determination of Coal-Ash Softening Temperature*, Fuel Eng. Co.°, A. S. T. M., March, 1940, p. 3.
Factors in Coal Carbonization* (1938), Carnegie Tech.
Gas Evolution on Heating*, Penn State.
Gas Pressures Within the Uncarbonized Part of a Charge of Coal Undergoing Carbonization*, U. S. B. M.
Hydrogenation of Indene-Coumarone Resins. Carmody Res. Lab.°, I. & E. C., Ind. Ed., May, 1940, p. 684; June, 1940, p. 771.
Low-Temperature Carbonization of Utah Coals†, Utah Conservation Res. Fdn.°, Report.
Mechanism of Coking Process*, Penn State.
Method for Determining Cubic-Foot Weights of Crushed Bituminous Coal to Approximate Weights of Coal as Occurring in Byproduct Ovens*, A. S. T. M.°, Com. D-5 (Vol. 38, part 1).
Methods of Increasing Toluene Yield in Coal Carbonization*, Columbia Univ.
Properties of Commercial Cokes*, Carnegie Tech.
Removal of Small Quantities of Materials and Gases in Tar*, Mellon Inst., for Koppers Co.
Stresses and Strains During Carbonization, Eastern Gas & Fuel Associates°, A. G. A.
Survey of Carbonizing Properties of American Coals*, U. S. B. M.°, for A. G. A., T. P. 604.
Survey of Methods for Determining Gas- and Coke-Making Properties of American Coals; Microscopic Examination of Coal, U. S. B. M.
Synthetics From Tar*, Mellon Inst., for Koppers Co.
Upgrading of Coal-Tar and Light-Oil Fractions by Distillation and Crystallization, Etc.*, Mellon Inst., for Koppers Co.
Utilization of Tar and Light-Oil Fractions as Sources of Commodities of Value*, Mellon Inst., for Koppers Co.

Combustion of Coal and Its Products

Action of Organic Sulphur in Gaseous Fuels on Glazes During Firing*, U. S. B. M. and Univ. of Ala.
Burning of Individual Unsupported Particles of Coal to Determine Influence of Properties of the Coal and of the Physical Conditions Within a Furnace for Combustion of Pulverized Coal*, Carnegie Tech.
Burning Solid Fuels on Traveling Grates*, U. S. B. M.
Coal Softening and Its Effect on Stoker Operation With Preheated Air†, Am. Eng. Co.
Combustion of Granulated Coal*, B. & W. Co.
Combustion of Coal in Manufacture of Cement, Lafayette Coll.
Combustibility of Coke in Air†, U. S. B. M.°, R. I. 3499.
Combustion Characteristics of Stoker Coals*, Univ. of Kan.
Combustion of Lignite and Subbituminous Coals*, U. S. B. M.
Combustion of Pulverized Coal*, Carnegie Tech.
Correlation of Agglutinating and Agglomerating Index With Coking Action of Fuels in Furnace*, U. S. B. M.
Development of Pulverized-Coal Burners*, B. & W. Co.
Development of Pulverized-Coal-Fired Boilers for High Rates of Combustion Suitable for Locomotive Service*, B. & W. Co.
Effect of Design and Operation on Mechanical Loading of Distributing Pushers in Multiple-Retort Underfeed Stokers†, Am. Eng. Co.
Fuel Beds to Determine Influence of the Physical and Chemical Characteristics of the Fuel on Conditions Existing Within the Beds*, Carnegie Tech.
Furnaces for Smokeless Combustion of Stoker-Burned Coal*, B. & W. Co.
Furnace Temperatures in Pulverized Coal-Fired Units*, B. & W. Co.
Heat Transfer*, Yale Univ.
Ignitability of Coal and Coke*, Battelle Mem. Inst. for A. S. T. M., Com. D-5.
Mechanism of Combustion of Volatile Matter* (1935), Carnegie Tech.
Performance of Coal-Fired Space Heater, Battelle Mem. Inst., private sponsor.
Principles and Practice in Coal Pulverizing*, (1940), U. S. B. M.
Radiation*, Yale Univ.
Rate of Oxidation of Anthracite*, Penn State.
Rates of Reaction of Solid Fuels With Oxidizing Gases* (1931), Carnegie Tech.
Reactivity and Ignition Characteristics of Coals and Cokes to Determine Causes of Variations of These Properties for Solid Fuels of Different Origins*, Carnegie Tech.
Relative Ease of Ignition and Rate of Combustion of Different Coals, Semicokes and Cokes, etc., and Effect of Chemical Composition and Physical State on These Properties; Also in Case of Cokes, Effect of Preparation Method (Coking Temperature, Oxidation and Coal Rank)†, H. C. Porter°, I. & E. C., Aug., 1940.
Space Requirement for Combustion of Pulverized Coal, M. I. T.°, I. & E. C., Ind. Ed., May, 1940, p. 719.
Stoker Test on Combustion of Illinois Coals* (1938), Ill. G. S.
Temperature and Gas Compositions in Fuel Beds* (1937), Carnegie Tech.
Two-Stage Furnace and Open-Pass Furnace for Pulverized Coal*, B. & W. Co.
Use of Overfire Air in Small Volume or Overfire Rear-Pass Combustion Gases, All at High Velocity, for Smokeless Combustion, Reduced Slagging of Heating Surfaces and Increased Efficiency*, Am. Eng. Co.
Use of Speeded Motion Pictures of Stoker Fuel Beds to Correlate Laboratory Tests to Stoker Performance*, Consolidated Edison Co. of N. Y.°, Mech. Eng., Oct. 1939.

Domestic Furnaces and Boilers

Automatic Comfort Heating With Bituminous Coal*, Penn. State.
Burning Characteristics of Anthracite*, U. S. B. M.
Domestic Heating and Air-Conditioning, Nat. B. & S.
Combustion of Coal in Residential-Type Mechanical Stokers*, U. S. B. M. with Univ. of Washington.
Combustion of Small Briquets on Small Stokers†, Battelle Mem. Inst., private sponsor.
Comparison of Coal and Oil for Domestic Heating Plants*, Iowa State Coll.‡
Cook Stove to Heat Water, With Water Back for Service Water*, Anth. Inst. Lab.
Development of Improved Cooking Range†, Battelle Mem. Inst., private sponsor.
Draft and Draft Control*, Anth. Ind. Lab.
Equipment for Automatic Heating of Residences*, Battelle Mem. Inst., for Bit. Coal Res.
Design and Test of Invertible Grate for Hand-Fired Domestic Furnaces*, Ill. G. S.
Performance of Stoker-Fired Warm-Air Furnace†, Battelle Mem. Inst., private sponsor.
Performance Test and Development of Heating and Cooking Stoves and Service-Water Heaters*, Battelle Mem. Inst., for Bit. Coal Res.
Suitability of Coal for Small Stokers†, Battelle Mem. Inst., private sponsors.
Tests of Secondary-Air Devices for Domestic Furnaces*, U. S. B. M.

Equipment and Material for Mines

Analysis of Explosives*, U. S. B. M.
Analyses of Power Consumption by Coal-Mining Equipment*, U. S. B. M.
Blasting With Different Types and Quantities of Stemming*, U. S. B. M.
Cable Under Schedule 2D*, U. S. B. M.
Causes of Ignition at Gallery No. 1*, U. S. B. M.
Collection and Testing of Field Samples of Permissible Explosives*, U. S. B. M.
Comparison of Ballistic Mortar and Ballistic Pendulum*, U. S. B. M.
Conveyor Practices in West Virginia Coal Mines*, W. Va. Univ.‡ (1942).
Construction of Cars for Transportation of Explosives*, U. S. B. M.°, I. C. 7115.
Cutter Bits (Performance, Types, Materials of Construction)*, U. S. B. M.
Diesel-Mine-Locomotive Hazards*, U. S. B. M.
Effectiveness of Stemming*, U. S. B. M.
Electrical Accessories, Such as Motors, Controllers, etc., for Suitability and Explosion-Proof Qualities*, U. S. B. M.
Electrically Operated Coal-Cutting Equipment for Permissibility*, U. S. B. M.
Electrically Operated Loading Machines for Permissibility*, U. S. B. M.
Electric-Type Shotfiring Devices for Permissibility*, U. S. B. M.
Field Studies of Diesel Mine Locomotives*, (1940), U. S. B. M.°, R. I. 3541.
Fire Extinguishers for Use Underground*, U. S. B. M.
Fire-Retardant Treatments of Liquid-Oxygen Explosives, U. S. B. M.°, Bull. 429.
Flame Safety Lamps for Permissibility*, U. S. B. M.
Gas Detectors for Permissibility*, U. S. B. M.
Improved Flame Safety-Lamps Testing and Demonstration Apparatus, U. S. B. M.
Machinery in Mines*, U. S. B. M.
Mechanical Mining in Anthracite Mines*, U. S. B. M.
Methods Used in Blasting Coal With Blasting Devices*, U. S. B. M.
Mine Telephones and Other Signaling Equipment for Permissibility*, U. S. B. M.
Miscellaneous Electrically Operated Outfits for Permissibility*, U. S. B. M.°, R. I. 3497.
Mobile Loader Practice in West Virginia Coal Mines*, W. Va. Univ.‡
Permissibility of Oxygen Breathing Apparatus*, U. S. B. M.
Physical Tests of Explosives and Blasting Devices to Determine Their Permissibility for Use in Coal Mines*, U. S. B. M.°, R. I. 3507, 3537.
Portable Electric Lamps for Permissibility*, U. S. B. M.°, Sch. 6-D.
Relative Strengths of Various-Shape Timbers, U. S. B. M.
Safety Clothing*, U. S. B. M.
Safety Equipment and Methods of Hoisting in Shafts*, U. S. B. M.
Storage-Battery Locomotives and Power Trucks for Permissibility*, U. S. B. M.
Storage of Oil and Grease Underground*, U. S. B. M.
Treatment and Effectiveness of Brattice Cloth in Mines*, U. S. B. M.
Types of Mine-Rescue Stations*, U. S. B. M.
Underground Transportation in Coal Mines*, U. S. B. M.°, R. I. 3519.
Use and Abuse of Respiratory Equipment*, U. S. B. M.
Use and Testing of Hoisting Ropes in Mine Shafts*, U. S. B. M.
Use of Barometers at Coal Mines*, U. S. B. M.
Use of Reflector Buttons Underground*, U. S. B. M.
Use of Rock Dust to Prevent or Limit Mine Explosions*, U. S. B. M.°, R. I. 3529.

Gas—Use, Production and Treatment

Carburization With Coal Gas, Natural Gas, Propane and Butane; Continental Industrial Engineers, Inc.
Cleaning of Flue, Blast-Furnace and Other Gases*, A. D. Little, Inc.

Correlation of Analysis of Coal With the Products of Carbonization in Externally Heated Retorts, U. S. B. M.°, R. I. 3482.
Development of Small-Scale Gas Producer*, Battelle Mem. Inst. for Bit. Coal Res.
Effect of Condition of Carbon Surface on Water-Gas Reaction*, Columbia Univ.
Gasification of Anthracite, Penn State for Anth. Inst.
Operating Procedure in Making Carburetted Water-Gas That Will Preclude Gummy Deposits in Pilot Lights*, Univ. of Wis.
Use of Anthracite in Manufacture of Gas*, Anth. Inst.
Use of Detector to Reveal Presence of Oxygen in Coal Piles Flooded With Inert Gas, Continental Industrial Engineers.
Water Gas From Peat† (may resume research later), Univ. of Minn.

Hydrogenation of Coal

Coal Hydrogenation*, U. S. B. M.°, R. I. 3498; I. & E. C., Ind. Ed., Jan., 1940, p. 73; June, 1940, p. 864; Oct., 1940, p. 1372.
Constitution of Coal Hydrogenation Products*, U. S. B. M.
Dehydrogenation of Hydrocarbons, U. S. B. M.
Hydrogenation of High-Temperature Tar*, U. S. B. M.
Hydrogenation Studies of Coal Constitution* (1934), Carnegie Tech.
Relation of Coal Petrography to Hydrogenation of Coals, U. S. B. M.

Nature of Coal

Botanical Constitution of Coal as Shown by Coal Balls, Thin Sections of Coal and Spore Material*, Ill. G. S.
Calorimetric Determination of Arsenic in Small Concentration, Coll. of Medical Evangelists and Univ. of S. Calif. School of Medicine, I. & E. C., Anal. Ed., Nov., 1940, p. 691.
Coal or Dolomite Balls*, Bot. Mus. of Harvard Univ.
Coals With Reference to Utilization*, Penn State.
Condition of Water in Coals of Various Ranks*, Penn State.
Constitution of Pennsylvania Bituminous Coal*, Penn State.
Determination of Sulphur by Evolution Method, U. S. Navy Yard, Portsmouth, Va.
Gas in Coal*, G. S. W. Va.
Investigation of Subbituminous Coals and Lignite*, U. S. B. M.
Microchemical Analysis of Coal and Coal Products* (1931), Carnegie Tech.
Microscopic Examination of Coals for Correlation Purposes*, Univ. of Kan.
Origin and Composition of Coal*, U. S. B. M.
Paleobotanical Constitution of Cannel Coal, Boghead Coals and Shale Oils*, Bot. Mus. of Harvard Univ.
Physical Chemistry of Humic Acids*, Penn State.
Properties of Non-Coking Coals, U. S. B. M.
Spores in Tennessee Coal*, Div. of Geol., State of Tenn.
Thermodynamics and Coal Formations*, Penn State.

Physical Tests for Coal

Classification of Dusts in Steam Coal in Relation to Fly Ash*, State Univ. of Iowa.
Comparison of Methods of Determining the Friability and Grindability of Coal*, U. S. B. M.
Determination of Surface Area of Finely Crushed Coal, Battelle Mem. Inst. for A. S. T. M., Com. D-5 on Coal and Coke.
Friability of Coal by Drop Shatter Test and Tumbler Test, A. S. T. M., Com. D-5 on Coal and Coke, with Fuel Res. Lab., Canadian B. of M.
Grindability of Coals by Ball-Mill or Hardgrove Machine to Determine Which Shall Be Used or Both, A. S. T. M., Com. D-5 on Coal and Coke, with U. S. B. M. and B. & W. Co.
Methods for Estimating Abrasiveness of Coal*, U. S. B. M. with Univ. of Wash.
Properties of Coal Surfaces, Penn State, I. & E. C., Ind. Ed., Dec., 1940, p. 1599.

Preparation and Briquetting

Construction and Demonstration of Briquetting Machine for Making Smokeless Briquets From Illinois Coal Without a Binder and Demonstration of Smokeless Combustion of Briquets*, Ill. G. S.
Cleaning of Slack Sizes of Iowa Coal to Render It Suitable for Domestic Use*, State Univ. of Iowa.
Clarification of Coal Washery Water†, U. S. B. M.°, with Univ. of Wash., R. I., 3494.
Coal Sampling at Mines and Tipples*, U. S. B. M.
Coal-Washing Problems in Alabama*, U. S. B. M.
Determination of Best Methods of Collecting and Reducing Samples of Coal*, A. S. T. M., Com. D-5 on Coal and Coke.
Drainage Characteristics of Alabama Coals†, U. S. B. M.
Drying of Peat*, Univ. of Minn.
Dustiness of Coal and Coke*, A. S. T. M., Com. D-5 on Coal and Coke.
Dustiness of Coal With Various Coal Treatments*, W. Va. Univ.
Dustproofing of Midwestern Coals*, Battelle Mem. Inst., for Bit. Coal Res.
Dustproofing of Stoker Coal*, Univ. of Ala.
Effect of Use of Calcium Chloride on Stoker Equipment*, W. Va. Univ.
Field Investigations of Coal-Washing Methods*, U. S. B. M. with Univ. of Wash.
Fleissner Steam Drying*, Univ. of N. D. with U. S. B. M.
Flotation to Recover Fine Coal From Washery Slurry*, U. S. B. M.
Fundamentals of Jigging*, Battelle Mem. Inst.
Gravity Classification of Fine Coal*, DuPont.
Horizontal and Vertical Current Classification*, Battelle Mem. Inst.
Performance Study of Small Truck-Mine Jigs*, U. S. B. M.
Powdered Coal and Its Preparation*, U. S. B. M.
Principles Underlying Sampling of Coal*, U. S. B. M.
Removal of Pyrite From Fine Coal by Froth Flotation*, Battelle Mem. Inst.
Systematic Determination of Bulk Density of Illinois Coals†, Ill. G. S., to be presented A. I. M. E., Feb., 1941.
Washability Curve Interpretation for Jig Middlings*, U. S. B. M.
Washability of Fine Sizes of Coal, Including Semi-Routine and Semi-Commercial Tests in the Laboratory*, U. S. B. M. and Univ. of Wash.
Washing and Coking of Washington Coals for Metallurgical Use on Pacific Coast*, U. S. B. M.

Safety and Health in Mining

Accidents Caused by Blasting Devices*, U. S. B. M.
Agents for Dedusting Coal Underground*, U. S. B. M.
Aging Tests of Gas-Mask Canisters*, U. S. B. M.
Air Suspensions (Explosive, Harmful and Noxious Dusts), Their Determination and Physical Characteristics*, Penn State.
Anthracite Mine Fires*, U. S. B. M.°, R. I. 3466 (1939); 7133 (1940).
Application of Motion Pictures to Mine-Accident Prevention*, U. S. B. M.
Approval Tests of Dispersoid (Dust, Fumes and Mist) Respirators*, U. S. B. M.
Approval Tests of Gas Masks*, U. S. B. M.
Approval Tests of Supplied Air Respirators (Hose Masks, Air-Line Respirators and Abrasive Blasting Masks and Helmets)*, U. S. B. M., I. C. 7130.
Barodynamic Studies of Roof Failure*, Columbia Univ.°, E. & MJ., July and Nov., 1940; *Coal Age*, July and Nov. 1940.
Causes of Mine Explosions and Effective Methods of Stopping or Limiting Them*, U. S. B. M.
Causes of Mine Fires and Methods of Preventing and Extinguishing Them*, U. S. B. M.
Characteristics of Impinger Dust Sampling*, U. S. B. M.
Chemical Considerations Relating to Fires in Anthracite Refuse, U. S. B. M.°, I. C. 7104.
Coal-Mine-Accident Costs, U. S. B. M.
Composition of Diesel Engine Exhaust Gas, U. S. B. M.°, R. I. 3508.
Compressibility and Crushing Strength of Pittsburgh Coal Bed in a Vertical Direction*, U. S. B. M.°, T. P. 605.
Cushioned Blasting*, U. S. B. M.°, R. I. 3510.
Determination of Carbon Monoxide Adapted to Standard Gas Analysis Equipment, Bit. Casualty Corp.°; I. & E. C., Nov., 1940, p. 661.
Determination of Composition of Mine and Tunnel Atmospheres, U. S. B. M.
Determination of Poisonous Gases From Explosives*, U. S. B. M.
Determination of Stresses in Rocks by Seismometers and Supersensitive Microphones*, U. S. B. M.
Effect of Changes in Humidity and Temperature on Mine Roof*, U. S. B. M.°, I. C. 7098.
Effect of Extension of Mine Mechanization on Mine Accidents*, U. S. B. M.
Effect of Health, Safety and Efficiency of Working Under Various Air Conditions as to Strata Gases, Explosives, Fumes, Air Temperatures and Humidity, Air Velocities, Etc., U. S. B. M.
Effect of Various Kinds of Mine Lighting on Safety, Health and Efficiency*, U. S. B. M.
Effect on Vision and Visibility of Mine Workers of Mine-Air Dustiness While Washing, Rock-Dusting, Etc.*, U. S. B. M.
Explosibility of Semi-Anthracite, Low-Volatile Bituminous-Coal and Medium-Volatile Bituminous-Coal Dusts, U. S. B. M.°, R. I. 3489.
Explosion and Corrosion Hazards From Acid Mine Waters*, U. S. B. M.
Explosion Prevention Service to Coal Operators and Others*, U. S. B. M.
Factors Contributing to Haulage Accidents and How Such Accidents May Be Prevented*, U. S. B. M.
Factors Influencing Nature and Quantity of Poisonous Gases Liberated by Explosives Under Mining Conditions*, U. S. B. M.
Fatalities From Explosive Fumes*, U. S. B. M.
Filtering Characteristics of Fibrous Filters, U. S. B. M.
Flammability of Gases and Vapors*, U. S. B. M.
Flame Propagation and State of Flame Gases*, U. S. B. M.
Gases and Explosions in Underground Conduits*, U. S. B. M.
Gases and Visible Fume Evolved in Arc Welding With Rods, Harvard School of Public Health for Air Hygiene; Air Hygiene Fdn. of Am., sponsor.
Handling of Man-Trips in Illinois Mines*, U. S. B. M.
Individual Susceptibility to Silicosis, Saranac Lab. with Air Hygiene Fdn. of Am.
Initiation of Coal-Dust Explosions by Electric Arcs*, U. S. B. M.
Initiation of Coal-Dust Explosions by Gas Explosions†, U. S. B. M.
Investigations of Explosions*, U. S. B. M.
Kinetics and Mechanism of Gaseous Explosions*, U. S. B. M.
Laboratory Study of the Flammability of Coal and Other Dusts*, U. S. B. M.
Mechanical Loading and Dust Hazards*, U. S. B. M.
Mechanism of Firedamp Ignition by Shots From Explosives*, U. S. B. M.°, T. P. 603.
Methods of Sampling and Analysing Coal-Mine Dusts for Incombustible Content, U. S. B. M.°, I. C. 7113.

Methods of Supporting Roof to Prevent Accidents*, U. S. B. M.
Methods of Administering First Aid to the Injured and of Giving Effective First Aid Instructions*, U. S. B. M.
Methods of Timbering to Aid in Prevention of Falls of Roof and Coal*, U. S. B. M.°, M. C. 40 (1939).
Methods of Treating Timbers to Prevent Decay or to Aid in Prevention of Mine Fires*, U. S. B. M.
Microprojector for Dust Counting, U. S. B. M.
Microscopy of Dispersoids (Dusts, Fumes and Mist), U. S. B. M.
Mine-Fire Investigations*, U. S. B. M.
Movement of a Stressing in Coal-Mine Roof*, U. S. B. M.
Occurrence of Electrical Accidents in Mines and Methods for Their Prevention, U. S. B. M.
Occurrence of Mine Accidents From Blasting (Including Explosives' Fumes) and Possible Means of Preventing Them*, U. S. B. M.
Occurrence of Noxious Gases in Coal Mines*, U. S. B. M.
Odor Intensity of Diesel-Engine-Exhaust Gas, U. S. B. M.
Oxidization of Carbon Monoxide and Hydrogen by Bacteria, U. S. B. M.
Particle Size in Relation to Silicosis, Harvard School of Public Health, for Air Hygiene Fdn. of Am.
Photoelasticity and Its Application to Mine Pillar and Tunnel Problems*, Columbia Univ.°, A. I. M. E., T. P. 1140.
Response of Living Connective Tissue in Clark Rabbit Ear Chambers to Pure Silica Particles*, Univ. of Pa., for Air Hygiene Fdn. of Am.
Roof Movement in Coal Mines*, U. S. B. M.°, R. I. 3506.
Roof Falls and Mine Subsidence, Penn State.
Safety in Hoisting and Haulage in Pitching Coal Beds, U. S. B. M.
Size Separation and Estimation of Size Properties of Dusts, U. S. B. M.
Subsidence and Roof Action*, W. Va. Univ.‡ (1941).
Spectroscopic Determination of Silica and Other Mineral Elements, U. S. B. M.
Spontaneous Heating of Coal in and Around Mines*, U. S. B. M.
Surface-Fire Hazards at Mines*, U. S. B. M.
Use of Rock Dust to Extinguish Mine Fires*, U. S. B. M.
Use of Rock Dust to Prevent or Limit Mine Explosions*, U. S. B. M.
Use of Water and Spray Nozzles to Allay Dust in Coal Mines, U. S. B. M.
X-ray Determination of Free-Silica, U. S. B. M.°, R. I. 3520.
X-ray Determination of Mine Dusts*, Penn State.

Surveys of Coals and Resources

Characteristics of Minable Coals of West Virginia*, G. S. of W. Va.°, Vol. XIII.
Coal Beds in Southeastern Mahoning County and of Western Carroll County, Ohio, Div. of G. S., Ohio.
Coal Resources of Indiana*, Dept. of Pub. Works, State of Ind.
Coal Resources of Kansas†, Univ. of Kan.‡, Bull. 32.
Correlation Chart of Pennsylvania, Rocks of North America, Univ. of Ill. with G. S. of Kan.
Correlation of Iowa Coals With Those of Illinois and Missouri*, Iowa G. S.
Curwensville Quadrangle, Pennsylvania*, Pa. G. S.
Distribution of Coal in Illinois Market Area*, Ill. G. S.°, R. I. 63, (1940).
Fayette County, Pa.*, Pa. G. S.‡
Friability, Grindability, Chemical Analysis and High- and Low-Temperature Carbonization Assays of Alabama Coals, U. S. B. M.°, T. P. 611.
Isopach Mapping of Pennsylvanian Beds of Eastern Interior and Appalachian Coal Fields*, Univ. of Ill.
Mapping of Pennsylvania Bituminous Coal Region*, Pa. Dept. of Mines.
Pennsylvanian Rocks of Tennessee, Southeastern Kentucky and Northwestern Georgia*, Univ. of Ill. with Geol. Soc. of Am.‡
Physical and Chemical Properties of Oregon Coals, U. S. B. M. with Ore. State Dept. of Geol. & Min. Indus.°, Bull. 20.
Southeastern Clearfield County, Pa.*, Pa. G. S.
Statistical Survey of Coal Production for Twenty Years in West Virginia to Determine Shifts of Tonnage by Districts and on Basis of Coal Thickness*, W. Va. Univ.
Structural Studies, No. 6 Coal†, (1930), Ill. G. S.°; South of Latitude of Mt. Vernon (1938, 1940), St. Clair, Madison, Montgomery, Macoupin, Bond, Clinton and Washington Counties (1941).

Swelling and Agglutination of Coal

Agglutinating Value of Coal*, A. S. T. M., Com. D-5 on Coal and Coke.
British Standard Swelling Test*, Penn State.
Determination of the Swelling Properties of Coals During the Coking Process*, U. S. B. M.°, R. I. 3539.
Mechanism by Which Side Thrusts Against Oven Walls Are Created With Means of Eliminating Such Dangers by Suitable Coal Blends, Coking Rate, Bulk Densities, Admixture of Inerts, Etc.*, H. C. Porter.
Plasticity and Swelling of Coal*, A. S. T. M.°, Com. D-5 on Coal and Coke, Vol. 38, Part I; Vol. 39.
Plasticity of Coal*, U. S. B. M.°, I. & E. C., Ind. Ed., June, 1940, p. 792; July, 1940, p. 930.
Standardization of the Agglutinating Value Test for Coal*, U. S. B. M.
Swelling of Bituminous Coal as Related to Coking*, Penn State.
Swelling Coal as Related to Its Combustion on Underfeed Stokers, Battelle Mem. Inst.
Value of British Crucible Swelling Test for Coal*, A. S. T. M., Com. D-5 on Coal and Coke.

Uses of Ash

Ash and Colliery Refuse for Manufacture of Thermal Insulation, Mellon Inst.° for Anth. Inst. Lehigh Univ. Anth. Conf. Proceedings.
Fly Ash With High Carbon Content, Univ. of Calif. for Res. Corp.‡
Use of Ash and Colliery Refuse in Industry*, Mellon Inst., for Anth. Inst.

Uses of Coal and Its Byproducts

Activated Carbon From Anthracite*, Penn State, for Anth. Inst.
Activation of Anthracite*, Lehigh University.
Activation of Coal Surfaces*, Penn State.
Beneficiation of Low-Grade Hematite With Lignite*, Univ. of N. D.
Coal and Coal Refuse as a Source of Humus*, U. S. B. M.°, R. I. 3516.
Coal as a Raw Material for Activated Carbon*, U. S. B. M.
Coal as a Raw Material for Carbonaceous Exchangers*, U. S. B. M.
Colloidal Fuel (Stability of Mixture, Grinding Methods, Flow Characteristics, Atomizing and Burning)*, Kan. State Coll.
Dehydration of Glauber's Salts With Lignite Stack Gases*, Univ. of N. D.
Extraction of Manganese From Low-Grade Ores at Chamberlain, S. D., by Use of Iowa Coal Brasses*, Iowa State Coll.
Gas-Absorbent Carbon From Lignite*, Univ. of N. D.
Use of Anthracite in Cupolas*, Hudson Coal Co.°, Lehigh Univ. Anth. Conf.
Utilization of Coal Refuse*, U. S. B. M.

Ventilation of Coal Mines

Air Conditioning in Mines*, U. S. B. M.
Determination of Composition of Mine and Tunnel Atmospheres*, U. S. B. M.
Fan-Pipe Discharge (Study of Flow, Effect of Shape and Size of Discharge Opening), U. S. B. M.°, R. I. 3531.
Methods Used to Cool, Heat or Humidify Intake Air*, U. S. B. M.°, I. C. 7098.
Mine-Ventilation Field Studies*, U. S. B. M.
Mine-Ventilation Research*, U. S. B. M.
Particle Size Distribution of Atmospheric Dust in Bituminous Coal and Metal Mines*, U. S. B. M.
Suitability and Applicability of Instruments and Methods of Sampling Mine Air as to Dustiness, Harmful Gases, Etc.*, U. S. B. M.°, I. C. 7122.
Use of Water to Reduce Air Dustiness*, U. S. B. M.°, I. C. 7131.
Ventilation Methods in Mechanized Coal Mines*, U. S. B. M.
Ventilation of Coal Mines*, W. Va. Univ.

Miscellaneous

Coal Mining Methods and Costs*, U. S. B. M.
Control of Acid Mine Water*, U. S. B. M.
Conveyor Loading in W. Va.*, W. Va. Univ.‡ (1942).
Design and Development of Coal-Burning, Internal Combustion Engine*, Battelle Mem. Inst. for Bit. Coal Res.
Development of Code for Rating Coal-Fired Space Heaters*, Battelle Mem. Inst. for Bit. Coal Res.
Domestic Heating and Air Conditioning, Nat. Bur. of Standards°, L. C.-596.
Effect of Flooding on Acidity of Mine Drainage*, U. S. B. M.
Flooding and Dewatering of Mines*, U. S. B. M.
Haulage Methods and Hoisting in Steeply Inclined Mines, U. S. B. M.
Ignition Temperatures and Factors Affecting Explosibility of Magnesium, Zinc, Iron and Other Powders†, U. S. B. M.
Lighting Practices in Coal Mines in the United States*, U. S. B. M.
Mechanical Loaders in West Virginia*, W. Va. Univ.
Microbiology of Coal*, Penn State.
Multiple-Shift Mechanized Mining*, U. S. B. M.
Occurrence of Coal Beds*, Dept. of Conservation, Mich.
Power Consumption in Coal Mines (With Particular Reference to Consumption of Individual Machines—Locomotives, Cutting Machines, Mobile Loaders, Conveyors), U. S. B. M.
Prevention and Extinguishment of Fires in Waste Piles at Coal Mines, U. S. B. M.°, I. C. 7104.
Reactions of Phenols*, (1939), Carnegie Tech.
Storage, Spontaneous Combustion and Sampling of Subbituminous Coal and Lignite, U. S. B. M.

---

* Items starred indicate the work on such projects was still continuing at close of 1940.

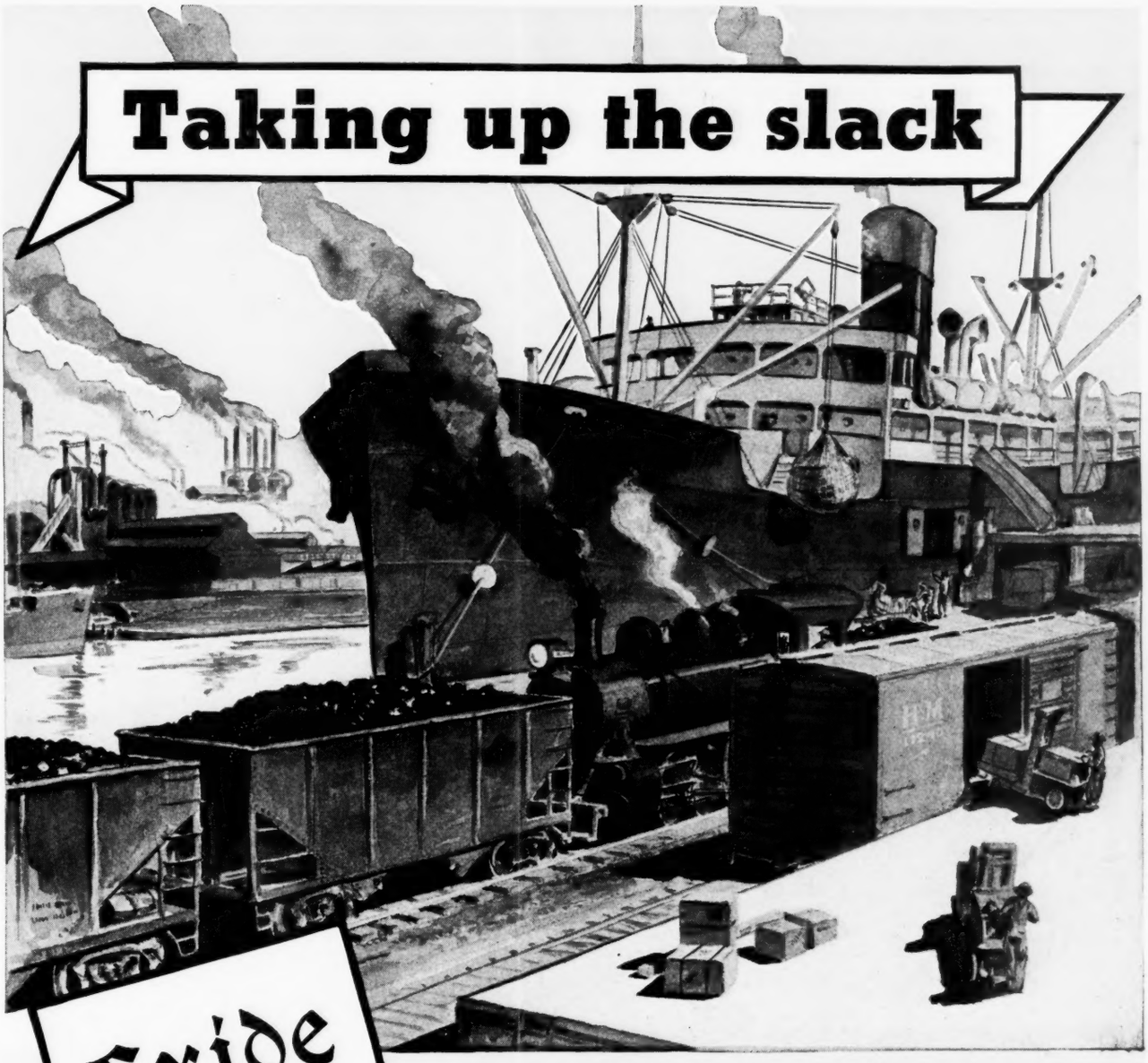
† Items with dagger were concluded in that year.

° Items marked with circle indicate that an article has appeared describing some of the results of the investigation.

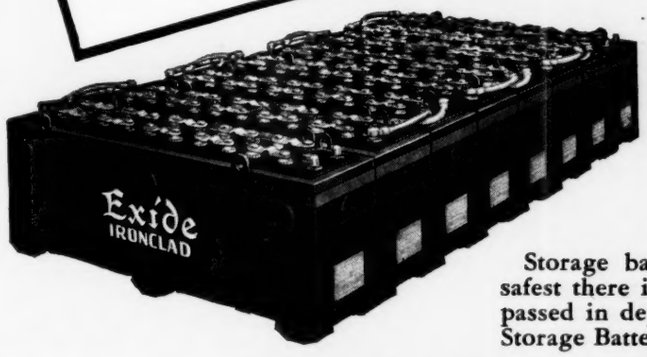
‡ Items marked with a double dagger indicate that a report probably will be made in 1941 or in the year therein indicated.

Figures shown in parentheses against name of project indicate year in which project was started. Absence of notation indicates informant failed to indicate year of initiation or status of project. Notations following name of scientific body making the research and of the company sponsoring it refer to papers or reports in which these investigations were, in whole or in part, communicated. Certain of the items in the listings might with almost equal propriety be grouped under some other heading. Where the project is of multiple interest or where it cannot be listed under any one subject, it is placed under "Surveys" or "Miscellaneous".

Taking up the slack



Exide
IRONCLAD
BATTERIES



Exide-Ironclad's dependability underground helps speed up the wheels of industry

When industry calls for fuel — more fuel — Exide-Ironclad Batteries help the mines to keep coal trains loaded and rolling. For these batteries predominate in mine service. Their tremendous, tireless power permits the haulage of greater loads at higher speeds, and has contributed to the success and growth of mechanized mining.

Above all, the dependability of Exide-Ironclads has earned them the utmost confidence. They are tough, rugged, trouble-free batteries, well able to deliver years of faithful service with only the minimum of maintenance.

Storage battery propelled equipment is recognized as the safest there is. When powered by Exide-Ironclads it is unsurpassed in dependability as well. Write for free booklet, "The Storage Battery Locomotive for Underground Haulage."

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia
The World's Largest Manufacturers of Storage Batteries for Every Purpose
Exide Batteries of Canada, Limited, Toronto

NEW LIGHT ON OLD QUESTIONS

How Block Pillars in Pittsburgh District Are Drawn Clean by Machines

A FOREMAN who desires to mine all the coal in the seam and do it with mobile loaders has a difficult job laid out for him, if the cover over the coal is heavy and strong and the floor is disposed to heave badly under pressure. If he follows the block method of extraction in use around Pittsburgh, he must not venture to take much coal during development, and he must regard as development not only his headings and crosscuts but his rooms also. Such rooms must be driven narrow and designed not so much to produce coal as to cut the coal seam into pillars, so that the coal can be removed later. These development workings must be so planned that the little coal removed by them will leave the coal seam almost undisturbed until pillar drawing commences.

This is well illustrated by the methods pursued at the Springdale mine of the Allegheny Pittsburgh Coal Co. These methods are similar but not identical with those in use in large parts of the Pittsburgh field, where conservation of resources, weak bottom and heavy, strong cover make essential the utmost care in operation.

At Springdale, the clay bottom is about 5 ft. thick and exceptionally weak even for the Thick Freeport Seam. Despite the most conservative development, it will shear along the pillars and heave badly. The cover has an average thickness of 500 ft., and in places is 650 to 700 ft. thick.

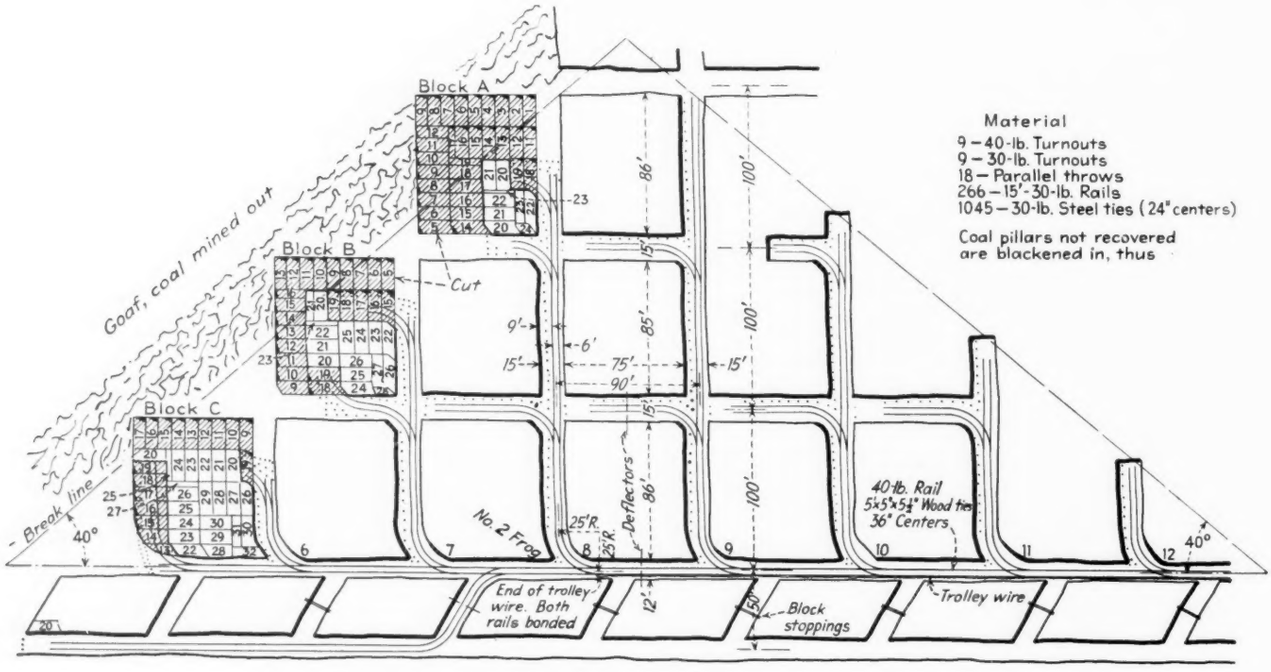
Headings and their crosscuts are driven 12 ft. wide, rooms and their crosscuts 15 ft. wide, whereas chain pillars between headings are 38 ft. wide and pillars between rooms are blocked out 75 ft. wide and 85 or 86 ft. long. Thus, the pillar is five times as wide as the room.

Pillars are drawn on retreat, and when that is done the coal bed back of the breakline, is almost solid, and further to assure that this will be so, the timing of the driving of the rooms is so arranged that the latter are completed ready for pillar drawing only just shortly before the several pillars are drawn.

At all times, in any room entry, there is but one room at a time idle and standing ready for pillar drawing. In every working area, three rooms are being depillared, Nos. 6, 7 and 8 in the illustration; one, No. 9, is standing (the one just described as driven its full distance and awaiting depillaring), and three, Nos. 10, 11 and 12, are in advancing stages.

The breakline is roughly 40 deg. off the line of the entry in a counter-clockwise direction; that is, in a direction contrary to that traveled by the hands of a clock as it moves over its face. The line joining the ends of the advancing rooms also is roughly 40 deg. off the line of the entry, but with the angle in the opposite direction; that is, clockwise from the line of the entry. Back of this triangle is solid undeveloped coal clear to the face entry.

Though experience with mechanical loading at Springdale covers only a few years, operations with manual labor extend over a long period. Rooms used to be driven at 45-ft. centers. Attempts were made to make the break line at an angle of 30 deg. from the line of the entry, but with that angle too much development had to be standing at all times; thus the area under stress was too greatly extended; accordingly, the weight overrode the pillars. At one time an angle of 49 deg. was provided,



Drawing pillar blocks in rectangular slices, 8 ft. 4 in. wide x 20 ft. long.

Table I—Order in Which Cuts Are Made in the Three Pillar Blocks Against Goaf

Cycle Number	Cuts in Block *A*	Cuts in Block *B*	Cuts in Block *C*	Total Cuts	Cycle Number	Cuts in Block *A*	Cuts in Block *B*	Cuts in Block *C*	Total Cuts
1	1	0	0	1	Carried forward	28	20	14	62
2	1	0	0	1	18	2	2	1	5
3	1	0	0	1	19	2	2	2	6
4	1	0	0	1	20	2	2	2	6
5	2	1	0	3	21	2	2	1	5
6	2	1	0	3	22	2	2	2	6
7	2	1	0	3	23	2	2	2	6
8	2	1	0	3	24	1	2	2	5
9	2	2	1	5	25	0	2	2	4
10	1	2	1	4	26	0	2	2	4
11	2	2	1	5	27	0	1	2	3
12	2	2	1	5	28	0	1	2	3
13	1	2	2	5	29	0	0	2	2
14	2	1	2	5	30	0	0	2	2
15	2	2	2	6	31	0	0	1	1
16	2	2	2	6	32	0	0	1	1
17	2	1	2	5					
	28	20	14	62	Total	41	40	40	121

but this angle was found to interfere with the correct timing of cutovers. One can discover these matters best by trial and error.

It will be noted that the air is deflected by a curtain just inby the completed room (No. 9) and thus compelled to travel up this room to its last crosscut. It enters also the three advancing rooms (Nos. 10, 11 and 12), being compelled to travel to the several faces by curtains which are not shown.

Once it reaches the second crosscut in the completed room, No. 9, it is readily directed to the various working faces returning either by rooms and crosscuts or along the break line, for the roof usually holds up for a while beyond the stubby points of projecting coal along that line. But the air also may escape over the roof falls and pass through the goaf to the return. No auxiliary fans are used.

The trolley line is ended at the outby side of the first room which is being depillared (No. 8), as the air from the other outby rooms is swept to the room faces and hardly any of it returns to the haulageway short of the break line which ends at the last crosscut of the room entry.

Each pillar is centercut and loaded out in 40 or 41 separate almost rectangular sections known as "cuts." The order in which disposal is made of these is indicated in the plan by numbers; where the same numbers appear more than once, they represent cuts made at about the same time; that is, as part of the same operating cycle, the mobile loaders in any cycle moving by stages from the cut furthest from the entry to that nearest it and working only at cuts designated by the number of the cycle.

Where Cuts Are Lacking

Number of cuts varies from three to six. If the number is below five, the cutter will have time to make a cut or cuts at the retreating end of the entry chain pillar and the loading machine will load it. Most economical operation is obtained when five or six cuts are loaded in each operating cycle.

Work commences by cutting and loading four cuts on the left side of the "top," or inby, pillar of Room 8, in the block marked *A*; this work is done usually by the equipment being used in driving rooms and room crosscuts. Cutting starts here as always at the outby end of the rectangle which is being centercut and proceeds toward the inby end, but except at the back the cuts are not extended the full distance to the inby.

A little wedge-shaped pillar of coal 4 ft. thick in front and running out at the back of the cut is left at that end to support the roof, so as to protect the workers, cutting machines, loading machines and other equipment as they go forward to remove other rectangular areas. The size of the wedge depends on the roof pressures. Where there is no weight at the cut corners, the coal is removed completely for the full width of the cut, but heavy posts are set to protect the men while at work. Track is laid, of course, as the lift advances.

After the four cuts are made and removed, cut No. 5 is made in Block *A*, and this time a cut No. 5 is made also in the left side of that same block catercornered from Block *B* and a third cut No. 5 made in the corner of Block *B* corresponding to cut No. 1 in Block *A*.

After that, in their appropriate cycles, cuts Nos. 6 to 9 are made on the top lift of Block *A*, also Nos. 6 to 12 on the goaf-side lift of the same block and Nos. 6 to 13 in the top lift of Block *B*. In the ninth cycle, the first side lift is started in Block *B* and the first top lift in Block *C*. Cuts are made until the top and side lifts of Blocks *A*, *B* and *C* are removed.

Sequence of removal for the three blocks is as in Table I. The blocks are almost similarly divided into rectangles but they are not absolute replicas of each other, and occasional variations that will not interfere unduly with the maintenance of a straight break line sometimes are permitted. Whenever there is any trouble in finding a place to cut and load, the equipment is moved to the entry for the removal of entry pillars.

Jeffrey L-400 mobile loaders are used on the pillars and Joy 8 BU's under abnormal conditions. A Myers Whaley Automat is used for driving entries. From any block having neither faulty coal nor gas wells which need to be guarded by barrier pillars, about 90 per cent of the coal is recovered. Because of thin coal and protection against gas wells, the final recovery varies and is somewhat less than 90 per cent.

Track is laid on the opposite side of the room from the pillars to be mined, so that the curves into the pillar readily can be provided. Posts are put on the same side of the room as pillars to be drawn. They may not be necessary as the roof is good, but safety thereby is more certainly assured.

•

Old Stoppings Need to Be the Tightest Yet Usually Are in Worst Condition

IN THIS department it was stated (January, p. 65) that under somewhat normal conditions the resistance of a 10-ft. length of an airway is only about 0.00219 in. of water gage, just about one five-hundredth of an inch. Though the fan may make 2 or even 5 in. of water gage, one can easily see that at the most remote crosscut in the main entry, where the air pressures at the two ends of the last crosscut, if 30 ft. long, differ only three times as much, or 0.00657 in. of water gage, the air has very little power. A light cloth hung across the airway, even if it fills the cross section, will droop limply in the gentle breeze.

In the first crosscut, however, the pressure will be that of the full water gage, 2 or even 5 in., for s in the equation $p=ksv^2 \div a$ is the entire distance between the two sides of the brattice or door that the air will have to travel to get from one side to the other (and that distance may be tens of thousands of feet) multiplied by the periphery of the airway. At the crosscuts between the extreme outby and extreme inby crosscuts, the differences in pressure will decline, for the distances that the air has to travel will become shorter and shorter until the shortest distance will be reached at the most remote crosscut, and there the differences in pressure will be no greater than that for an equal distance of travel in the heading.

Hence, the first crosscuts should have the tightest stoppings or all the air will pass through them and none will reach the face. The tighter stoppings are made, the more effort the air will make to pass through them, because, so long as there are no leaky stoppings ahead, the air will have to take the long course and go to the face, and will not be able to avoid that travel of tens of thousands of feet. Unfortunately, the first stoppings in a mine usually are the least able to resist the passage of air, as time, with its rot and pressure, has made them inadequate. It is these old inefficient stoppings that are required to resist the passage of air under the heaviest of mine pressures.

All the air that doesn't go to the face is "slacker" air. It takes power to put it into the mine, and it does no good whatsoever. Only the air that gets to the face helps in the battle against methane, depleted air, carbon dioxide and fumes. So, the stoppings near the mine mouth should be kept tight and renewed if necessary, but the others also should be tight, otherwise the air will be forced further into the mine, with increased use of power, and still will not reach the face, where alone it can do good.

QUESTIONS ASKED BY STATE BOARDS

Mine Foremen's Examination, Iowa, June 11–12, 1940 *

Bandages

Q.—For what purposes are bandages applied in first-aid work?

A.—(1) For pressing by tourniquet method a hard substance against an artery, thus stopping the flow of blood in case such a blood vessel is lacerated.

(2) For binding an injured person's members against splints so as to render broken bones or a broken back immobile and prevent, in the first case, a compound fracture or, in the second, any movement of the spine.

Explosives

Q.—Does dynamite exert a greater force downward than in other directions?

A.—The action of an explosive is equal in all directions. When laid on rock or coal and exploded, dynamite will break that material, because its expansion is so violent and sudden that even the air will confine it sufficiently in an upper direction to permit of forceful action on the underlying support.

Drillholes

Q.—What does the State law say as to drillholes, when unlawful to charge or fire?

A.—No drillhole may be charged until the shot examiner has examined it. If in his judgment it would be unsafe to fire, he shall forbid its charging or the firing of the shot if thus charged and he shall make a cross with chalk at the mouth of the hole and enter this fact in a book he shall keep for that purpose, giving name of person working in place and number of holes condemned, with date, keeping this record for at least a week. Charging or firing a shot in such hole is forbidden, and even the foreman may not cause the hole to be charged or shot fired.

Delivering Powder

Q.—Describe law in reference to transportation of powder and storage.

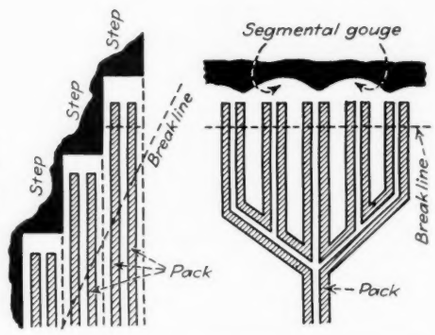
A.—No powder or other explosive may be transported by electrical means into any coal mine until after all employees have left the mines. Powder or other explosives must be delivered by operator or by men employed by him for that purpose. No operator shall permit storage of such materials inside a mine, but each miner may have in his possession at any one time not more than two kegs, each of 25 lb., of powder and other explosives sufficient for one day's use, which must be kept in a locked wood or metal box set at a reasonable distance from the track. Black powder and high explosives must be kept in separate boxes. However, enough powder or other explosives can be stored at the end of the electric or mechanical haulage at the face of the mine for the next day's use.

* Continued from p. 67, January (1941), COAL AGE.

Straight Vs. Zigzag Faces

Q.—Can a zigzag longwall face be secured as easily as a straight one?

A.—General belief a few years back was that longwall faces should be either stepped or gouged a little so as to increase safety, but modern practice does not favor such a face, which involves the support of a larger area if the fall is to be kept back an equal distance from all points in the face, for the face outsettings or salients bring the breakline of the roof away from the body of the face, providing additional areas that need support. The question has died down so completely in recent years that it would seem that the new practice of eliminating steps or segmental gougings has been found satisfactory from a safety standpoint. Moreover, as salients project from the solid face line they receive an undue proportion of the weight of the overhanging roof and tend to crush. Their effect on ventilation is bad and with mechanical loading the presence of such irregularities in the face would make work difficult and prohibitively costly.



Angles in pillars experience heavy pressures and breakline advance is delayed.

First Grade Mine Foremen's Examination Pennsylvania*

Pillar Drawing

Q.—What must be carefully considered before work of drawing pillars is begun?

A.—Before drawing pillars, possibility of future development must be considered carefully; and effect that taking out of the pillars will have on adjoining workings and on surface. Work must be so arranged that line of pillar work will be on angle best suited for local conditions and more or less straight, so that no excessive pressure will be thrown on any of the pillars. The question of the presence of water or gas in the overlying strata or in adjoining workings must be determined and provision made to avoid accident on this account. (8 per cent.)

Hoisting

Q.—What are legal requirements in hoisting shafts in regard to following: (a) Code of signals; (b) speed of cage while hoisting men; (c) safety gates; (d) inspection and reports?

A.—(a) One rap or whistle—to hoist coal; one rap or whistle—to stop car or cage when in motion; two raps or whistles—to lower car or cage; three raps or whistles—to hoist persons. Engineer shall signal back when ready, after which person shall get on car or cage, and then one rap or whistle shall be given to hoist. Four raps or whistles—to turn steam on pumps. (2 per cent.)

(b) Speed of the cage when lowering or hoisting persons shall not exceed 900 ft. a minute. (1 per cent.)

(c) All shafts shall be provided with safety gates controlled by cage at top and intermediate landings, said gates to be approved by inspector. (1 per cent.)

(d) All ropes, links, and chains shall be carefully examined, at least once every 24 hours, by a competent person delegated for that purpose by superintendent; and any defect therein found, by which life and limb may be endangered, shall be reported at once in writing to superintendent, who shall immediately proceed to remedy defect; and until that is accomplished he shall prohibit any person from being lowered into or hoisted from mine by the defective apparatus. Person making said examination shall keep a daily record of each inspection, in ink, in a book kept at the mine office for that purpose, and he shall send a copy thereof each day to superintendent.

Safety catches shall be tested once every two months, and a record of each test shall be sent to inspector and to superintendent and also recorded with ink in a book kept at mine office for that purpose. (3 per cent.)

* Continued from p. 67, January (1941) COAL AGE.

Examination Questions, Steam Hoisting Engineers, Illinois, 1940

Feed Water Heaters

Q.—If a boiler generates steam at 85 lb. pressure, what percentage may be gained by heating the feed water, originally at 65 deg. F., by means of a feed water heater to 200 deg. F.?

A.—Quite roughly the saving is 1 per cent for each 11 deg. the feed water is heated, which is 200—65=135 deg. The saving, therefore, is 135÷11=about 12 per cent.

A more accurate method is to use steam tables. Steam is at 85 lb. pressure as measured on steam gage. Absolute pressure is 85+14.7 lb.=99.7 lb.=say 100 lb. per square inch. Heat content of saturated steam at 100 lb. absolute pressure is 1,186.3 B.t.u. per pound. Heat content of water is raised in feed water heater 200—65=about 135 B.t.u. per pound. Proportion of heat gained =135÷1,186.3=0.1138. Percentage of heat gained=0.1138×100=11.38.

Types of Boilers

Q.—(a) In what respect does a flue boiler differ from a tubular boiler? (b) Which is the more economical and why?

A.—(a) In a flue boiler, the combustion gases travel through large flues which are surrounded by water. In the tubular boiler, tubes carry the combustion gases through the water. In a water-tube boiler, which may be meant where the expression "tubular boiler" is used in the question, the tubes are surrounded by the products of combustion of the fuel.

(b) The water-tube boiler is the more efficient because of a larger heating surface.

Definitions

Q.—What is meant by water line, steam space and heating surface of a boiler?

A.—*Water line* is the level contour of the surface of the water.

Steam space is the space within the boiler above the level of the water where the steam can collect.

Heating surface.—The entire boiler area exposed to the heat of the fire in the furnace and to the heat in the combustion gases. This, however, may be subject to a technical interpretation, as see a previous answer to question on the determination of the horsepower of a tubular boiler.

Thickness of Boiler Plates

Q.—What thickness of boiler plate would be required for a boiler carrying 100 lb. pressure, the diameter of the boiler being 6 ft.?

A.—When a circular shell is subjected to internal pressure, a diameter can be drawn anywhere across the center from periphery to periphery and the pressures on every square inch of one half of the circumference will be pushing that half away from the other. These pressures are not parallel, but the forces to the left of a perpendicular to the diameter chosen will be no more oblique to that perpendicular than those to the right.

So, the side components of the stresses balance each other and the total pull per 1-in. ring around the boiler at the two ends of the diameter=100 lb. per square inch × length of the diameter in inches. Thus the total pull per inch along the boiler=100×72 =7,200 lb. per square inch. However, a stress five times as large must be imagined, so as to provide a factor of safety of 5. Thus the figure will be 36,000 lb. per square inch.

Unless welded the boiler will be weakened by joints. Assume butt joints are used with outside and inside welt strips giving an efficiency equal to 86 per cent of that of the undrilled plate. If the plate will withstand a tensile stress of 55,000 lb. per square inch, a reasonably low figure, it will resist when thus drilled and riveted only 55,000×0.86, or 47,300 lb. per square inch.

The force pulling the boiler apart as stated is figured as 36,000 lb. per square inch. The force holding it together is 47,300 lb. per square inch if 1 in. of plate is doing the holding. Dividing 36,000 by 47,300 it is clear that the thickness must be about 0.76 in. But this is the aggregate width of the plate on both sides of the boiler, as has been explained. Hence, half that will suffice, or 0.38 in., which for all practical purposes is 0.375 in., or ⅜ in.

•

Questions, First Class Mine Managers' Examination, Illinois, 1940

Traversing Survey

Q.—If the horizontal angles and distances of a survey are as follows:

Course Designation	Bearing of Course	Distance in Feet
1–2	N. 37° 13′ E.	413.6
2–3	N. 10° 56′ E.	246.7
3–4	S. 17° 23′ E.	253.0
4–5	S. 43° 37′ E.	216.0
5–6	S. 33° 43′ W.	789.0

how far north or south and west or east of Sta. 1 is Sta. 6? Calculate the course and distance from Sta. 1 to Sta. 6.

A.—The traverse of the survey is as in accompanying table:

TRAVERSE OF SURVEY AND CALCULATION OF CLOSING COURSE

Bearing of Course	Distance in Feet	Cosine of Angle	Latitudes N or S	Sine of Angle	Departures E or W
N. 37° 13′ E.	413.6	0.79635	+329.37	0.60483	+250.16
N. 10° 56′ E.	246.7	0.98185	+242.22	0.18967	+ 46.79
S. 17° 23′ E.	253.0	0.95433	—241.45	0.29876	+ 75.59
S. 43° 37′ E.	216.0	0.72397	—156.38	0.68983	+149.00
S. 33° 43′ W.	789.0	0.83179	—656.28	0.55509	—437.97
		Plus totals	+ 571.59		+521.54
		Minus totals	—1,054.11		—437.97
		Latitude and Departure of Closing Course	— 482.52		+ 83.57

Latitude=Distance × cosine of angle of deflection. Departure=Distance × sine of angle of deflection.

In this traverse, north latitudes are marked plus, and south latitudes minus; east departures are marked plus, and west departures minus. Sta. 6 is therefore 482.52 ft. south and 83.57 ft. east of Sta. 1. To find the bearing of the course from Sta. 1 to Sta. 6 divide the difference in departure by the differences in latitude. Thus, 83.57 ÷ 482.52 = 0.17319 = tan 9°50′, which is the angle the course 1-6 makes with the meridian. The bearing of the course is, therefore, S 9°50′ E. The length of the line 1-6 is found by dividing the difference in departure by the sine of the bearing of the course 1-6. Thus, 83.57 ÷ sine 9°50′ = 83.57 ÷ 0.1707 = 489.6 + ft.

Mensuration

Q.—A square field having an area of 32,400 sq.yd. overlies a seam of coal 4 ft. thick, pitching at an angle equal to 1 ft. vertical in 6 ft. horizontal; what is the total weight of coal in this field, if its specific gravity is 1.28?

A.—The area of the field as given is based on its horizontal or mapped projection and must be divided by the cosine of the angle of inclination of the seam to obtain the corresponding area measured along the slope of the seam. The tangent of the angle of inclination in this case is 1 ÷ 6 = 0.1667, and the angle of inclination is, therefore, 9° 28′. Hence, for the corresponding area in the seam, 32,400 × 9 ÷ cos. 9° 28′ = 32,400 × 9 ÷ 0.98639 = 295,623 sq.ft.

Multiplying this area in square feet by (1) the thickness of the seam in feet, (2) the weight of 1 cu.ft. of water in pounds, and (3) the specific gravity of the coal, we obtain the actual weight of coal in this field in pounds, and have 295,633 × 4 × 62.5 × 1.28 ÷ 2,000 = 47,300 short tons.

Geology

Q.—What is the difference between a coal seam and a mineral vein?

A.—As coal seams were laid down on a nearly level surface, the rocks which were formed below and above the seam on parallel planes, known as planes of stratification, parallel the coal bed. These strata—known as floor, coal and roof—however, may have been tilted or folded at any angle since they were laid down and may now pitch heavily. A mineral vein is a body of mineral lying in a fracture or other opening in the strata, usually at an angle thereto. Thus, the vein may be at any angle to the strata in which it lies. It has entered either as a solution or in molten form and usually strings out in many directions into the mother rock or inclosing rocks.

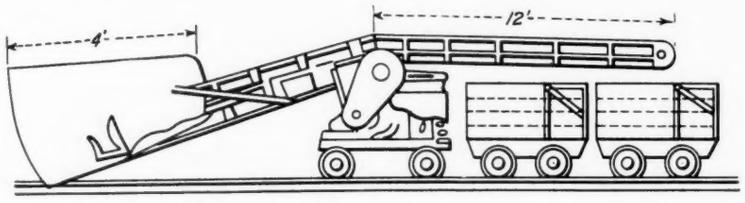
WHAT'S NEW IN OPERATING IDEAS

Haulage-Road Cleaner Made From Pit-Car Loader

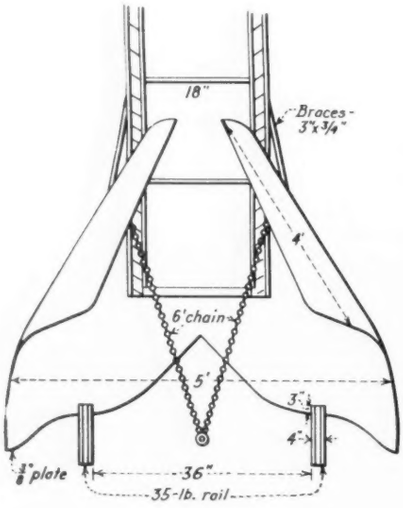
"We all are vividly aware of one phase of coal mining that has no friends—road cleaning—the least efficient of all underground operations at most mines," writes Alex Bennett, Springfield, Ill. Because of its unfavorable nature, "much difficulty always has been experienced in obtaining enough help to get the job done," and it nearly always is a slack-season operation—"a furtive get-'em-by-any-means occasion for the management and a nightmare for the men. One can readily visualize the mere fraction of the hoped-for crew strung out at 15- to 20-ft. intervals and the accompanying dust storm of blizzard proportions, with its aftermath of spitting coom and black-eyed vituperation. It seemed inevitable that out of the dust we eventually would pluck—well, not a flower—but at least a reasonably good idea.

"The accompanying sketches show an ordinary four-wheeled hand-loaded conveyor, or pit-car loader, equipped with a 3-hp. motor. Welded to the conveyor frame on its underside and braced to its upper sides by ¾x3-in. steel bars is a gathering head of ⅜-in. boiler plate grooved at track gage to fit snugly on the rails. The grooves in this instance are 4 in. wide and 3 in. deep, but can be fashioned to suit larger or smaller rails.

"A 4½-ft. extension is welded to the boom to increase its length to 12 ft. and permit loading two cars before switching. The under plate of the gathering head has a cutting edge running back to a receding center to take packed dirt in its stride. A bridle made of 6-ft. lengths of chain is attached to the upper part of the side braces to permit coupling to a locomotive. The cable furnishing power for the conveyor is attached by a hot hook to the locomotive trolley-pole harp and thus conveyor operation can be controlled by the motorman.



Side view of track cleaner.



Showing construction of gathering head and bridle on track cleaner.

"Auxiliary equipment consists of three locomotives and the necessary motormen and cars. One locomotive hooks onto the bridle in front of the conveyor. The second follows up with two cars. The third locomotive waits at the sidetrack with two more cars to make the change. The efficiency of the machine is definitely linked to the accessibility of the switching points, which seldom are close and in this instance are approximately 4,000 ft. apart. Still, in preliminary operation, three motormen, at a cost of $19.20, have rung up a record of 78 cars of road dirt in 6½ operating hours.

"When one considers that the previous all-year average for the mine stood at 4½ 3-ton cars per man-day, one can readily see the possibilities of the machine. At first, the motormen were equipped with respirators, but it was found that heavy sprinkling of the area to be cleaned with water 24 hours before starting work eliminated the dust problem and had no appreciable effect upon the efficiency of the machine. It should be noted that the pulling bridle is attached so that the gathering head tends to bear down firmly on the track."

•

Worn Crusher-Roll Teeth Are Rebuilt by Arc Welding

Only when crusher teeth are sharp and of standard shape do they crack the coal so uniformly as to make a minimum percentage of undersize. Time wears off the tops of the teeth and the word "crusher" soon proves to be a correct designation for equipment which has been designed not to crush but to break the coal as with a pick. Quite usual practice is to replace the segments as they become worn.

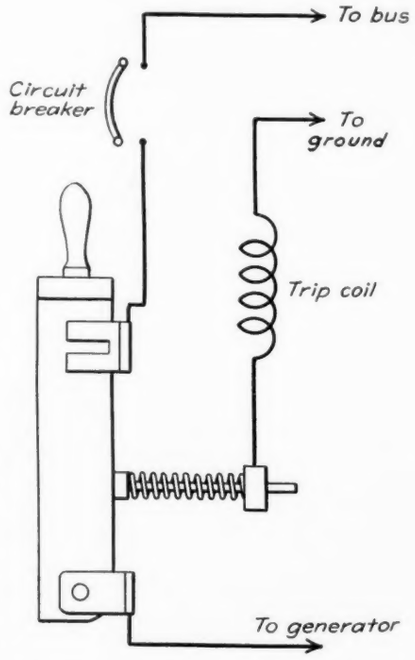
At the Providence Repair Shops of the Hudson Coal Co., near Scranton, Pa., however, roll-crusher segments when their teeth are so worn that they no longer crush effectively, or to the size desired, are repaired with Stoodite which is deposited on the worn teeth by arc welding. As soon as the tooth is "built up" and while the metal is not yet hard, a mold is hammered against it by a light jackhammer; this both toughens and shapes the metal.

Though the repair of such a segment is as costly as the purchase of a new one, for there are a multitude of points to be reconditioned, repair by Stooditing is found advantageous because the segment so repaired will give 30 to 50 per cent longer service than the old one.

•

Safety Device for Electric Switch Designed to Prevent Burns

To prevent a person getting burned by opening a switch while a machine is pulling a heavy current, H. H. Wagner, chief electrician, Cambria Fuel Co., Holsopple, Pa.,



Showing safety device to prevent burns in opening switches under heavy loads.

We DON'T Prescribe the "REST CURE"... for Coal Tipples

We prescribe modernization of your present equipment so you can keep abreast of today's demand for clean, prepared coal.

Morrow Engineers, with 25 years experience, have economically solved almost every conceivable coal handling problem—and can modernize your present tipple with least disturbance to your production schedule.

Every installation from a single screen to a complete tipple is given personalized, individual attention by Morrow Engineers . . . you have only one negotiation . . . one responsibility.

Why not let a Morrow Engineer discuss your preparation needs?

Tonic

A Morrow-Prins Coal Washer operating in your tipple will separate and clean 75 tons of coal hourly per foot of width. Its clean product is a SURE TONIC to your sales . . . and profits.

MORROW

MANUFACTURING CO. WELLSTON, OHIO

DESIGNERS AND BUILDERS OF COAL HANDLING EQUIPMENT FOR OVER 25 YEARS

suggests the hook-up shown in the accompanying diagram. Under this arrangement, the switch must be pushed in tightly to make contact with the trip coil. Then if an attempt is made to pull the switch before releasing the breaker, the breaker will fly out instantly as soon as the switch is moved and thus interrupt the current.

•

Cement Used in Making "Paint" For Mine Applications

"Since good housekeeping is one of the virtues attributed to progressive mine operators," writes P. C. Ziemke, Milwaukee, Wis., "the art of properly concocting and applying a durable, light-reflecting 'paint' is one that should be of interest. One proceeds by thoroughly scraping, brushing or sandblasting all metal or concrete surfaces to remove rust, scale and loose particles from previous coats or other natural incrustations. Wash the cleaned areas down with brooms and buckets or with a spray hose where no electrical hazards exist. Then, while the surface is still wet, apply a mixture of 100 lb. of hydrated lime, 50 lb. of white portland cement, 10 lb. of common salt and sufficient water to form a liquid of the right 'paint' consistency.

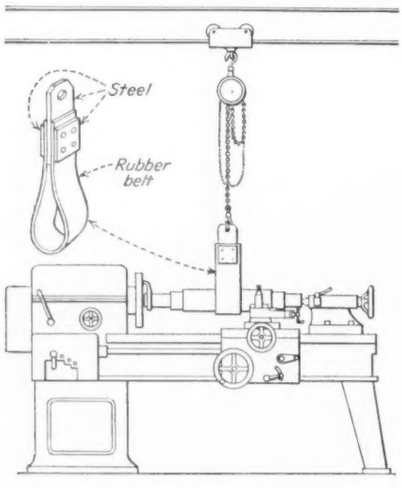
"Mixing can be expedited by attaching a short shaft and a propellor to a ¼- or ½-hp. motor. This solution can be applied easily by hand-brushing or spraying, and is followed 24 hours later by a second application for 100-per-cent coverage where necessary. Such a paint job is waterproof and highly resistant to chipping, scaling or dusting. Best of all, it is a great hindrance to fire where wood is used."

•

Sling and Block Over Lathe Save Time and Fingers

Machinists who have worked in shops where slings are installed above medium-sized lathes are of the opinion that to do without them is to promote inefficiency. The accompanying sketch shows the sling arrangement used in the central shop of a large coal-mining company. A loop of conveyor belting cut 6 in. wide is bolted to a steel hanger supported by a ½-ton chain block. The latter hangs from a trolley running on an I-beam track parallel to and directly above the lathe. In making a heavy shaft requiring considerable machine work at each end (shoulders, tapers and threads), such as an armature shaft for a 15-ton-locomotive motor, the sling is left hanging over the shaft during a large part of the machining.

With this arrangement the machinist does the work himself when it comes time to change ends instead of calling another man to help him. Use of the sling reduces the chance of mashed fingers and other injuries resulting from dropping a piece of work out of the centers.

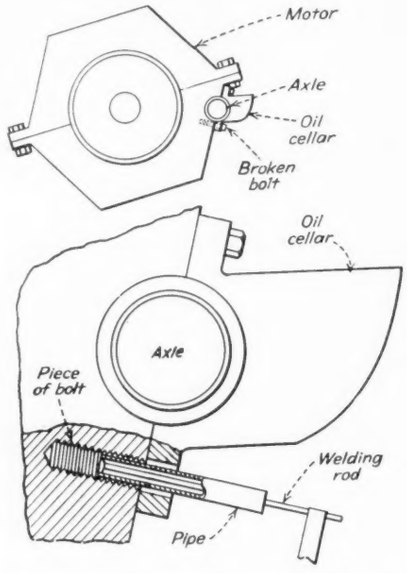


The sling is left on the shaft while the ends are being machined.

•

Broken Stud Bolts Removed By Welding on Pipe

"While we are doing a lot of fretting over mechanical mining equipment, including rubber-tired haulage units, nevertheless the old gathering and haulage locomotives still are around to give us a few headaches," writes Thomas James, mine manager, American No. 2 mine, Knox Consolidated Coal Corporation, Bicknell, Ind. Consequently, Mr. James offers the accompanying sketch showing a standard type locomotive



Showing locomotive motor with broken stud bolt.

motor with a stud bolt broken off in the case. Most electricians have had the job of drilling them out and know that if it is on the bottom it can be quite a task, generally necessitating hoisting the motor out of the frame or swinging the bottom half down into the pit. And even then, sometimes, the "easy out" doesn't want to pull the bolt after it is drilled.

"Here is a simple, quick trick that will pull the bolt seven times out of ten in one-twentieth the time required for the old drilling operation," says Mr. James. "The accompanying sketch shows the bottom axle-cap bolt broken off, leaving about an inch in the hole. To remove it by the new method, take a piece of pipe a little smaller in diameter than the bolt hole. Tape the pipe from one end back to where it will clear the hole. Place it in the hole firmly against the broken portion of the bolt. Then take a *coated* welding rod, insert it in the pipe and weld the broken piece of bolt to the inside of the pipe. Let cool a few minutes—not too long—and then use a small Stillson wrench to back the bolt out. It will work, as I have said, seven times out of ten.

"The tape, of course, will burn off during welding, but will keep the pipe from sticking to the side of the hole. The heat seems to loosen the most stubborn of stuck bolts. The job takes 15 minutes to a half hour, against one to four hours the other way."

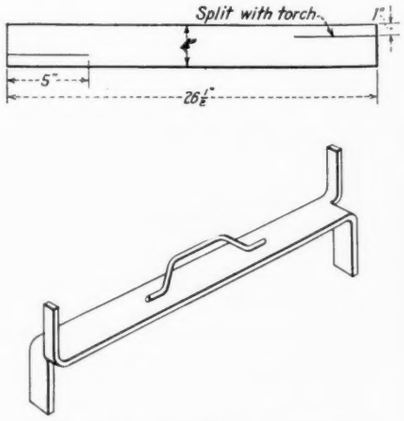
Square Pegs

When nothing but round holes are to be filled, square pegs are a liability rather than an asset. Or at least that is the sense of one old saw. By the same token, round pegs are not much use when the holes are square. So the answer might be to keep some of both on hand. The same with ideas. If a man has several in reserve, at least one is quite likely to be the answer to the problem with which he is confronted. This department is in the business of passing on ideas developed by operating, electrical, mechanical and safety men. So send yours in, with a sketch or photo if it will help to make it clearer. For each acceptable idea, Coal Age will pay $5 or more on publication.

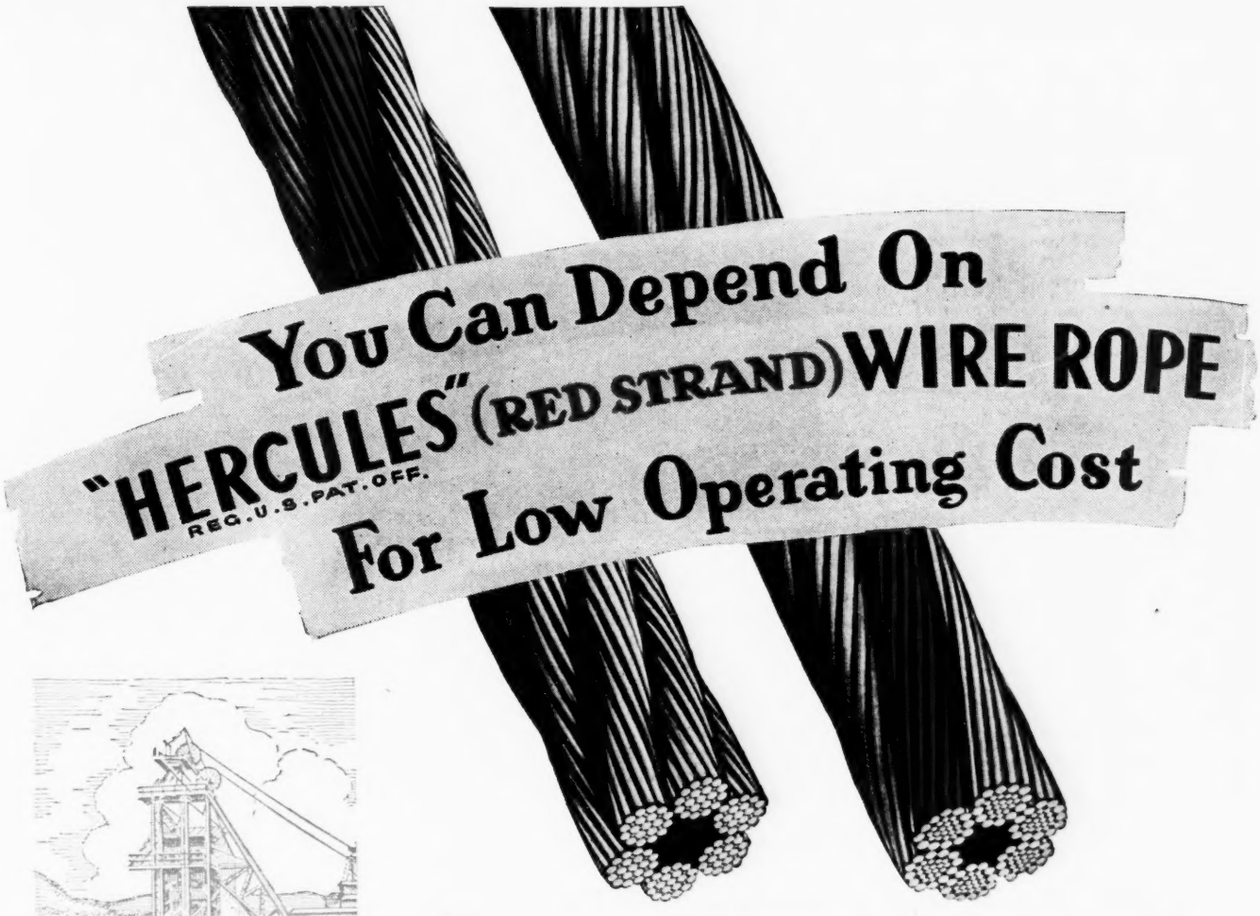
•

Bar Stock Split to Make Cutter-Chain Lock

Bother in their use and constant losses resulted in the substitution of the cutter-chain lock shown in the accompanying illustration for chains at the Morgan mine, Rivesville, W. Va. The lock was developed by Harold Daugherty, electrician, and is made from a section of drawbar out of a junk pit car. The length of drawbar stock is cut 10 in. longer than the width of the cutter bar (Goodman 12-AA,



Details of chain-lock construction.



You Can Depend On "HERCULES" (RED STRAND) WIRE ROPE For Low Operating Cost

REG. U. S. PAT. OFF.

Correct construction is also an important factor in wire rope economy. In "HERCULES" there is a right rope for every coal mining purpose, as it is furnished in both Round Strand and Flattened Strand constructions—all of which are available in either the Standard or Preformed type.

PRODUCTION requirements must be met. Why not let "HERCULES" (Red-Strand) Wire Rope help you meet this demand and still maintain a reasonable margin of profit?

You can rely on "HERCULES" to keep costs down, because it is made on the principle that—*"With wire rope it pays to use the best"* . . . In its entire process of manufacture, exacting tests and rigid inspections leave nothing to chance. All this, plus manufacturing efficiency, means longer rope life at no higher cost.

You will quickly discover that "HERCULES" (Red-Strand) Wire Rope is a dependable ally—not only in today's fight against increasing operating costs—but also in your endeavor to speed up production. Specify it on your next requisition.

MADE ONLY BY

A. LESCHEN & SONS ROPE CO.

WIRE ROPE MAKERS — ESTABLISHED 1857

5909 KENNERLY AVENUE — ST. LOUIS, MISSOURI, U. S. A.

NEW YORK . . . 90 West Street
CHICAGO . . 810 W. Washington Blvd.
DENVER . . . 1554 Wazee Street

SAN FRANCISCO . . 520 Fourth Street
PORTLAND . . 914 N. W. 14th Avenue
SEATTLE . . 3410 First Avenue South

12-AB and Jeffrey 35-BB machines). Width of the drawbars is 4 in.

With the bar stock cut to the right length, it is split for 5 in. on each end at a point 1 in. over from one edge on one end and the same distance over from the opposite edge on the other end. The bar then is heated and the 1-in. tongues bent up. At the same time, the 3-in. tongues are bent down. A handle then is welded on, making a lock which can be dropped over the chain to keep it from moving in case the bit clutch should happen to drop in. The two 1x5-in. tongues which stick up in the air hold tools and jack pipes, thus making the lock serve two purposes.

•

Grab Unloads Heavy Timber At 7,500-Tons-per-Day Plant

For the reception of timber, of which about 250,000 linear feet, 2 to 12 ft. long and of 6 to 10 in. diameter, has to be handled monthly, Olyphant colliery, Olyphant, Pa., north of Scranton, belonging to the Hudson Coal Co., has provided a yard on the level of a siding of the Delaware & Hudson R.R. alongside which travels a DC Industrial Brownhoist gasoline crawler crane of 12½ tons capacity equipped with a 50-ft. boom and a 65-hp. Climax Model TU gasoline engine. The crane travels on caterpillars between the yard and the railroad siding.

A grab on this crane (see drawing) made of steel plate at the shops will seize as many as eight 8-in.-diameter timbers, lift them out of the railroad car and deposit them at any desired point in the yard. It will also, if and as desired, pull the stakes by which the timbers are secured in the railroad cars. As many as 96 pieces of timber can be handled in ten minutes.

One man runs the crane, another stands in the railroad car and guides the grab, and a third man armed with a long steel-pointed pole directs the timbers, as unloaded from the cars, to the required position and stacks them so that they will not roll. The grab picks them up in such orderly array that when they are laid down they hardly need be subjected to any rearrangement.

None of the three men has to perform any hard labor, yet they together can unload

Crane transferring long posts from car to yard.

an average of three cars of timber daily. A power-driven saw cuts the car stakes into lengths suitable for lagging. However, in extremely thin coal some of this timber is used for posts.

All long sticks are piled horizontally, parallel with the track, though some car stakes are set at right angles to the track at a slight vertical inclination near the bottom of the piles of larger timbers to prevent the latter from attempting to roll. Short posts may be piled more promiscuously and later may be repiled as the small yard force finds opportunity. Men, of course, are employed in loading timber from the yard into mine cars. To the power saw is brought broken timber from the mine workings, where it is cut so as to save as much of each stick as possible.

•

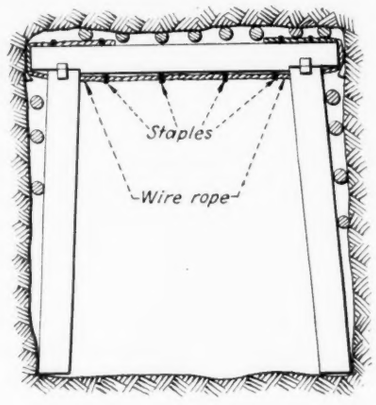
Fire Hazard Sharply Reduced By Rock-Dust Stemming

In certain mines, Alex Bennett, Springfield, Ill., points out, the character of the coal is such that fires regularly occur in the course of shooting with black powder and the usual clay stemming. These naturally result in considerable disruption of face-preparation and other activities, in addition to holding forth a constant threat of a major conflagration. At at least one operation, consequently, the management adopted the policy of using a dummy filled with rock dust next to the charge, completing the stemming operation with the regular clay. As a result, ignitions have been reduced to a minimum and no serious fires from shooting have occurred in more than six months on the new schedule.

•

Strengthen Timber Caps With Old Wire Rope

To get more strength than wood alone would afford the Mauchi mine, in Burma, uses a length of old wire rope starting from the top of a timber cap near its end and



Wire rope gives cross timber unusual strength.

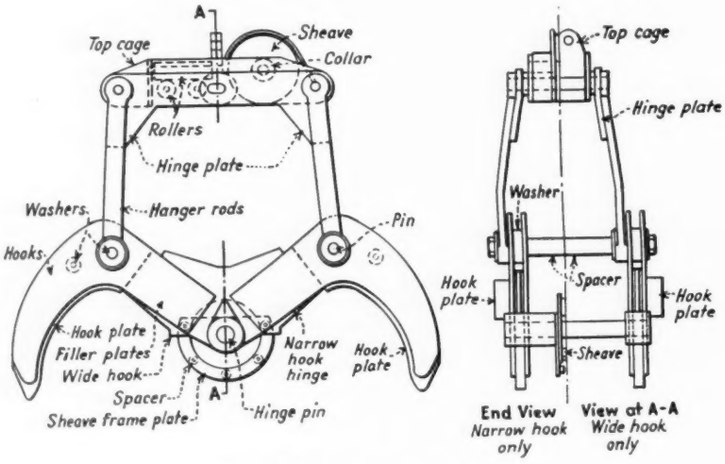
passing under it to the further end, where it is passed back to the top of the timber and there secured, according to an illustration in the bulletin of the Institution of Mining and Metallurgy. Staples are used under the cap to keep the rope in place, and on top of the timber to secure its ends.

•

Lids From Paint Cans Make Switch Signs

"Every progressive and safety-minded coal-mine operator has devised and put in service some system by which all men can tell when a switch, valve or other piece of equipment is out of operation for maintenance or repair work," writes K. N. Banthin, mining engineer, Oak Park, Ill. "Some of the most common systems are: padlock, or chain and padlock; painted metal tag with wire or chain; paper shipping tags of the wired type; differently colored lengths of wire; or removal of the handle or operating lever.

"Of these systems, the padlock or padlock and chain, with the key in only one man's possession, is recognized as the safest, although it is highest in initial and maintenance costs and is not as generally used. Metal, wood or paper tags have a lower initial cost, are less expensive to maintain and are used more generally, although they may not be as safe and positive as the padlock. But in a well-



Grab for lifting timber out of car.

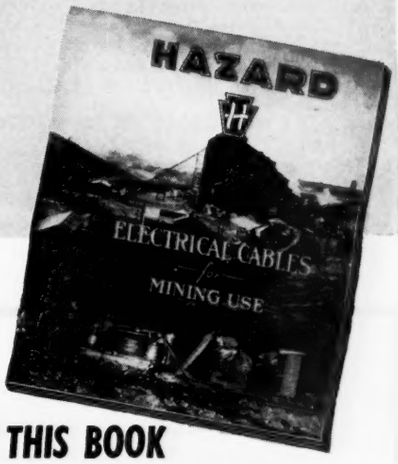
HAZARD PORTABLE CABLES

Single conductor reel cable.

Twin parallel construction.

Two conductor concentric.

Three conductor for AC Machines or low tension stripping shovels.



For POWER SUPPLY and MACHINE OPERATION

THE CONDUCTORS ARE EXTRA FLEXIBLE.

133 wire strands commonly used in sizes 8 to 2 making the cables very limp and easy to handle.

THE INSULATION IS EXCEPTIONALLY STRONG.

Hazard Standard Rubber insulation has a tensile strength of at least 1200 lbs. per square inch.

THE JACKET IS TOUGH, RESILIENT AND TEARPROOF.

Hazard reinforced rubber jackets contain at least 60% by weight of crude rubber, vulcanized in a continuous metal mold. They are dense, resistant to cutting and wear and have exceptionally high tensile strength.

SEND FOR THIS BOOK

The Hazard Mining Cable Catalog supplies complete data on sizes, strandings, capacities and weights of Hazard Mining Cables and also contains a wealth of useful electrical data. Copies gladly sent on request.

HAZARD INSULATED WIRE WORKS
DIVISION OF THE OKONITE COMPANY
Wilkes-Barre, Pa.
Offices in principal cities

HAZARD

Cables for Mining Operations

CINCINNATI
CUTTER CHAINS

. . . BETTER BECAUSE THEY STAND UP UNDER SEVERE OPERATING CONDITIONS!

Modern high-production cutting machines base much of their capacity on the chain they utilize . . . *and CINCINNATI CUTTER CHAINS are the choice of many* prominent operators in all parts of the country. For, regardless of strain, stress or long production schedules, CINCINNATI stands up and does a superior job. This ability to deliver, is due in part to superior materials and manufacture and in part to specialized design.

Primarily, it's the joint that bears the brunt of the wear, and here's where CINCINNATI excells . . .when the joint becomes worn, and the chain loses its pitch, replace the joint . . . it's inexpensive and the pitch of the chain is perfect again. Make your cutting operatings the lowest cost-per-ton operation in your mine—write CINCINNATI for details!

IT'S NO SECRET AS TO WHY CINCINNATI CHAINS ARE SUPERIOR

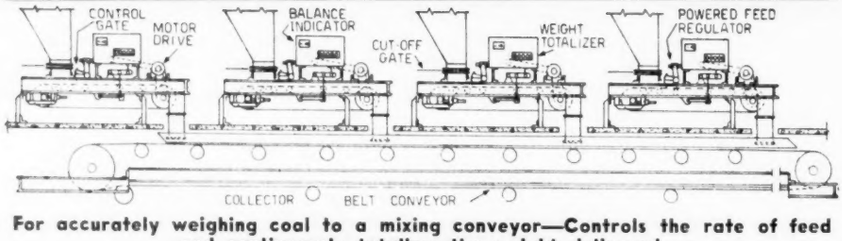
Primarily, it's the joint. The bearing pin is rigidly locked in the block by the flat on one side.

This easily replaceable rivet holds the bearing pin against longitudinal displacement.

Here's the connector insert. When placed in service along with the rivet and bearing pin, it completely renews the chain joint—making the pitch perfect again.

The CINCINNATI MINE MACHINERY Co.
Spring Grove & Meeker Sts. Cincinnati, Ohio.

FEEDOWEIGHT



For accurately weighing coal to a mixing conveyor—Controls the rate of feed and continuously totalizes the weight delivered

MERRICK SCALE M'FG. CO., Passaic, New Jersey

Shows safety sign made from paint-can lid.

regulated property they will prove useful in a number of locations in the prevention of injuries to maintenance men and other service employees.

"A coal mine which had standardized on a 5-in. round 16-gage disk with a chain and snap hook recently came across a definite improvement in the construction of signs of this type. During the painting of new additions to the tipple and conveying equipment a number of 1-gal. cans were emptied. A few of the can lids were painted the standard warning red stenciled with white letters like the regular safety disk.

"Use of the lid-type disks over a period of time has shown the following advantages: no cost (paint bought anyway); high resistance to buckling and bending due to the crimped edges, reducing cracking and peeling of the paint; less frequent painting and stenciling; elimination of sharp edges, as the lids are crimped and rolled; and less chance of signs falling into narrow cracks, since the crimping of the lids makes them about ¼ in. thick."

•

Cutting Through Rock Fault Done With Special Aids

A rock fault encountered in driving the main entry at the Dresser mine, Walter Bledsoe & Co., Terre Haute, Ind., offered a severe cutting problem which was solved by revisions in machine feed, use of tipped bits and the adoption of special anchors, reported Harry Cruikshank, chief electrician, in a paper presented at the December (1940) meeting of the Indiana Coal Mining Institute. The coal cut out completely, Mr. Cruikshank stated, "leaving nothing but rock with a limestone formation about 6 ft. in thickness with a softer rock above it. This top was full of slips and very bad to fall, making it necessary to crossbar the headings close to the face. Due to this crossbarring, it was not practicable to shoot the rock from the solid face and it therefore was undercut.

"On one machine the feed was changed to 12 in. and the bar length reduced to 6 ft. The regular machine bit was faced with Borod . . . Nine hundred heat-treated bits were used to cut 22 ft. of this rock, while the same footage was cut with only 250 Borod-tipped bits. At first, 40-lb. rails were used for rope jacks in cutting this rock, but the hard pull against the roof

7-ton concrete tunnels tied with rubber bands

A typical example of Goodrich development in rubber

EVERY big sewer always leaked. Everything was tried, to stop it—joints between the huge 7-ton sections of concrete pipe were made of asphalt, mortar, even metal wool, but workmen couldn't make such big joints perfect enough to be watertight after the earth began to settle.

This leaking sewage contaminated soil and water supplies, caused many serious epidemics. Rain water ran into sewers through the leaks—millions of gallons went through sewage disposal plants at useless expense.

Goodrich had developed for water line gaskets a rubber compound that keeps its life and resilience permanently. Could a big gasket be made strong enough to keep a tight joint between 7-ton sections of concrete?

A Goodrich engineer set to work, finally designed such a gasket. Like a huge rubber band 30 feet around, it slips easily over the lip end of the pipe. Ridges in the gasket, set at an angle, are squeezed down as the next pipe section is forced over them. Any movement of the pipe actually tightens the grip of these expanding rubber ridges. The Goodrich compound will keep its life and seal the joint indefinitely.

Soil and water lines are safer, rain water is kept out of sewers, expense of joint repair is saved, work can be done in winter as well as summer, costs are reduced—all because Goodrich maintains constant research in the application of rubber to solve industry's problems. Have you checked lately to see what improvements Goodrich has made in the belting, hose or other rubber products you use? *The B. F. Goodrich Company, Mechanical Goods Division, Akron, Ohio.*

Goodrich

First in Rubber

(Another story of Goodrich development work appears on page 1)

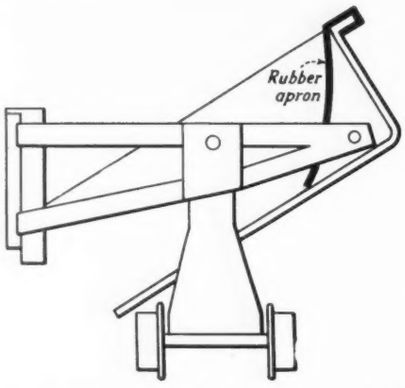
ADVERTISING PAGES OMITTED

loosened the rock and caused it and the rails to fall, creating a very unsafe condition for the operator. To eliminate this hazard, 2-in. holes 2 ft. deep were drilled in the bottom and a 2-ft. piece of rod with a hook on the end was placed in these holes to hook the machine rope on. This made an excellent and safe anchor for the machine rope."

•

Sticky Coal Freed From Cars By Flexing of Apron

Soggy fine coal sticking in the corners of mine cars and having to be scraped out is a problem which apparently can be solved in the same way as at a zinc-ore mine. Sheets of smooth rubber sheeting anchored along the top side do the trick.



The rubber sheet facilitates freeing of sticky material.

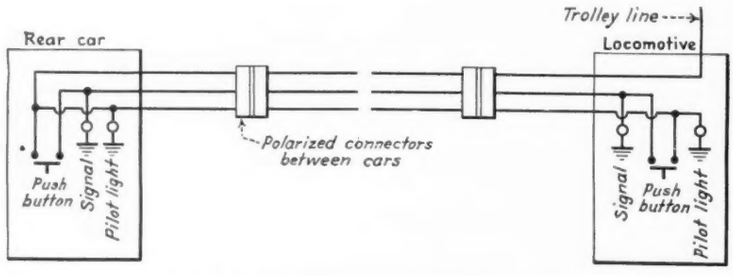
In the drawing, which shows an application by Goodyear to side-dump cars, the rubber sheet is clamped firmly along the top edge of the car. The smooth rubber surface and flexing cause the wet material to drop free. Obviously the same principle applied to the "contrary" corners of a coal car should work the same way. Moreover, it is likely that a strip only a foot or so in width and clamped to the side along a line 6 to 8 in. from the bottom would prove effective.

•

Trip-Length Communication Makes for Safety

To permit two-way communication between motorman and brakeman on 16- to 20-car trips hauled by a 13-ton locomotive, cars at a Western mine are fitted with three-conductor cables and Miller polarized connectors. As long as there is power on the locomotive and the circuit is complete, the arrangement enables the brakeman at the rear to signal the motorman regardless of noise and even though the trip is rounding a curve.

The station at each end consists of a pushbutton, red signal lamp and pilot lamp. Both pilot lamps burn all the time to show that the circuit from locomotive to last car is complete and that the rear-car signal station is connected. Signal lamps at both ends flash when either button is pushed. Additional investment and the time required to plug together the connectors between cars are the disadvantages which weigh against the safety and flexibility afforded by the system.



Locomotive-to-rear-car communication system.

•

Rerailer Made More Efficient By Raising Outside Rails

Fixed rerailers are not uncommon at coal mines, and in this respect the Dawson mine of the Dawson Coal Co., Clarksburg, W. Va., differs none from many others. The design of the Dawson rerailers, however, puts this operation in a special class. One of the several units recently installed at the mine, such as at the ends of the trestle across a hollow at the new drift mouth, is shown in the accompanying illustration. The outside rails on each side, it will be noted, are elevated above the top of the track rails, whereas the inside rails are placed, as is usual, on the same level. Thus, when a derailed car strikes the rerailer, the wheels on one side are raised above the track-rail level. At the same time the car is tilted and thus is in a better position to slide over and back onto the rails.

Fixed rerailer at Dawson mine, showing elevated outside rails and the use of metal throat plates.

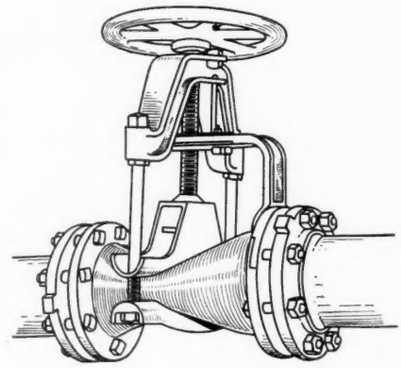
Rerailing is further facilitated by the use of sheet-metal plates in the rerailer entrances, which both elevate the wheels and provide a smooth surface on which the wheels can slide back to position. A marked increase in efficiency is reported by mine officials.

•

Flexible Tube Pinch Valve Adapted to Coal Jobs

An observant reader experienced principally in coal and also a reader of metal-mining journals suggests that few in the coal industry are aware of the possibilities of using rubber-tube pinch valves to solve special problems. These valves, devoid of a packing gland, are made regularly for 100- and 150-lb. pressures in 1- to 10-in. sizes.

One possibility for the valve is handling highly corrosive mine water. Other suggested uses are in coal-washing plants, in hydraulic refuse disposal and in transportation of fine coal to a power plant or storage basin by hydraulic methods. The reader mentioned directs attention to the fact that the pinch valve has possible advantages exposed to freezing, as at strip mines and in other coal-mining jobs where frost might cause trouble with conventional valves.



Valve reduces corrosion, abrasion and freezing troubles.

WHAT'S NEW IN THE FIELD

Moves to Extend Guffey Act; Advisory Group Named

Senator Guffey introduced a resolution in the Senate at Washington Jan. 31 which would extend the provisions of the Bituminous Coal Act of 1937 for two years after April 26, when it is due to expire. A similar resolution was presented in the House by Representative Boland.

An advisory committee to the Bituminous Coal Division to recommend a legislative policy and administrative practice was set up by Secretary of the Interior Harold Ickes on Jan. 30.

Committee members named were:

Representing the industry—George W. Reed, vice-president, Peabody Coal Co.; E. C. Mahan, president, Southern Coal & Coke Co.; L. E. Woods, president, Crystal Block Coal Co., and chairman of District 8 Producers' Board; Douglas Millard, sales manager, Colorado Fuel & Iron Corporation, and chairman of District 17 board; Charles O'Neill, president, United Eastern Coal Sales Co., and chairman of District 1 board.

Employees' representatives—Thomas Kennedy, secretary-treasurer, United Mine Workers; A. D. Lewis, assistant to the president, U.M.W.; Percy Tetlow, special representative, U.M.W.; Wally Hopkins, general counsel, U.M.W.; John T. Jones, president, District 16, U.M.W., and legislative representative.

•

Medill Again Named to Head Illinois Mine Division

Robert M. Medill, Springfield, appointed Director of Mines and Minerals of Illinois by Governor Green, was welcomed to familiar surroundings when he took office Jan. 15. Succeeding James McSherry, who held the office for two terms, Mr. Medill also served under two previous executives, Governors Lowden and Small.

Having been a mine executive, Mr. Medill knows the ropes from the operative as well as the labor standpoint, and is expected to retain the confidence of both sides.

•

New Mine for Big Sandy Area

A new company known as the Princess Elkhorn Coal Co. has been organized and has obtained a lease of about three thousand acres of coal land on Middle Creek and adjacent waters in Floyd and Magoffin counties, Kentucky. The new organization, officers of which include Harry LaViers, president, and G. J. Stollings, vice-president, has started plans for development of the property, which is underlain with a seam of Elkhorn coal. Temporary offices will be in the First National Bank Building, Paintsville, Ky.

The Chesapeake & Ohio Ry. has awarded a contract for construction of a branch line of about 10 miles from Prestonburg, Ky., northwestward along Middle Creek and its tributaries to the property.

•

Bootleg Ordinance Ruled Void By New York Magistrate

A New York City ordinance requiring truck drivers bringing anthracite from a distance 5 miles outside the city limits to have with them a certificate of origin of the coal was declared unconstitutional Jan. 21 by Magistrate William E. Ringel in Felony Court. The magistrate's ruling was made in the case of a trucker arrested Nov. 30 by an inspector of the Bureau of Weights and Measures of the Department of Markets for lacking a certificate. The defendant, when arrested, was hauling 18 tons of hard coal from Pennsylvania to the Arrow Fuel Co., Astoria, Queens.

The magistrate said that the ordinance, in effect, assumed that all anthracite brought into the city was stolen unless the truck driver could prove otherwise. "It has always been an elementary principle of our law," said the court, "that a person is presumed to be innocent until proved guilty by a competent court in a trial before a proper tribunal. The presumptions of guilt raised by this city statute are dangerous and unconstitutional."

Alex Pisciotta, director of the Bureau of Weights and Measures, said that the decision would not cause the bureau to abandon its enforcement of the section.

COAL AGE was founded in 1911 by the Hill Publishing Co. In 1915 *Colliery Engineer*, with which *Mines and Minerals* previously had been consolidated, was absorbed by COAL AGE.

When, in 1917, the Hill Publishing Co. and the McGraw Publishing Co. were consolidated to form the present McGraw-Hill Publishing Co., COAL AGE became a member of this larger publishing enterprise. On July 1, 1927, the journal was changed from a weekly to a monthly.

During 29 years the editorship has been held successively by Floyd W. Parsons, R. Dawson Hall, C. E. Lesher, John M. Carmody and Sydney A. Hale. The editorial staff of COAL AGE consists of: Sydney A. Hale, R. Dawson Hall, Walter M. Dake, Louis C. McCarthy, Ivan A. Given and J. H. Edwards.

A.I.M.E. Coal Division Meeting Lists Diversified Topics

Preparation, safety, mining methods, transportation and power distribution, utilization, research and economics will come in for consideration at the annual meeting of the Coal Division, American Institute of Mining and Metallurgical Engineers, Feb. 18 and 19, at the Engineering Societies Building, New York City. H. F. Hebley, chairman of the division's committee on papers and program, lists his material as follows:

"Purchase of Coal on Specifications," Ralph B. Textor, Textor Laboratories; "Flotation of Susquehanna River Dredge Anthracite," James Norman, P. Levin and R. R. Reese, U. S. Bureau of Mines; "Comparisons of Presentation of Washability Data," G. A. Vissac; "Table Practice in Alabama at the Alabama By-Products Corporation," H. J. Hager and P. H. Haskell, Jr., Alabama By-Products Corporation; "Control of Solids in a Closed Washing-Water System," J. A. Younkins, C. P. Proctor and E. D. Hummer, Pittsburgh Coal Co.; Symposium on Preparation of Anthracite, with introduction by W. H. Lesser, Pierce Management, Inc.; papers by George H. Jones, Jr., president, Stevens Coal Co.; John S. Johnson, Hudson Coal Co.; J. H. Doughty, Glen Alden Coal Co.; Eugene H. Florey, Lehigh Valley Coal Co., and C. D. Rubert, Lehigh Navigation Coal Co.; "Occurrence of Bony Coal in Castle Gate 'D' Seam and Its Effect on Ash Characteristics," Claude P. Heiner and Carl Westerberg, Utah Fuel Co.

"Equipment Essential for the Proper Handling of Mine Fires and Explosions," P. H. Dever, Glen Alden Coal Co.; "Some Problems in Connection With Ventilation of Mines Using Mechanical Loading Equipment," A. W. Hesse, Buckeye Coal Co.; "Proper Maintenance Procedure for Permissible Electrical Equipment," Karl L. Kennerth, H. C. Frick Coke Co.

Anthracite Problems Treated

"Methods of Borehole Lining," John S. Johnson, Hudson Coal Co.; "Mining Anthracite Pitch and Flat Veins Over Robbed Areas," W. H. Morre, Susquehanna Collieries Co.; "Experience With Gunite in Entries in the Pittsburgh No. 8 Seam in Ohio," James Hyslop, Hanna Coal Co.; "Development With and Against the Pitch," John E. Willson and Frank P. Lebar, Union Pacific Coal Co.

"Underground Belt Transportation," Carel Robinson; "Development in the Field of Mine Ventilation," Theodore H. Troller, director, Daniel Guggenheim Airship Institute; "Organization and Results Obtained in Shuttle-Car Transportation," John L. Schroder, West Virginia University.

"Relation of Coke Properties to Blast-

Furnace Operation," Martin A. Mayers and H. G. Landau, Carnegie Institute of Technology; "Relations Between the Properties and Yields of Coke and Byproducts, and the Characteristics of the Coal and Carbonization Practice," H. H. Lowry, Carnegie Institute of Technology.

"The Constancy of the B.T.U. Value of Pure Coal," J. E. Barkley and L. R. Burdick, U. S. Bureau of Mines; "Method of Determining Bulk Density of Commercial Coals," L. C. McCabe and C. C. Boley, Illinois Geological Survey; "Detonation of Electric Blasting Caps by Dry Batteries," S. L. Windes, U. S. Bureau of Mines; "Bituminous Coal Production at Varying Levels of Business and Its Relative Use Value Compared to Former Years," D. P. Morton, Chesapeake & Ohio Ry.

•

Appalachian Wage Parley Set for March 11

The Appalachian wage conference, affecting about 70 per cent of the coal tonnage of the country, will start March 11 in New York City. This field embraces Pennsylvania, Maryland, Virginia, West Virginia, Ohio, Michigan, eastern Kentucky, Tennessee and Alabama. Negotiations will be for a two-year pact to take the place of the existing one, which expires on March 31.

Considering that there was a six weeks' cessation of work in the Appalachian field in 1939 before an agreement was reached, there is much speculation on what will happen at the conference this year. One industrial leader well known in the Chicago area expressed the view that the sentiment of the country in general "would not stand for a strike of large proportions in the coal fields of the nation. At the same time, I don't believe anyone would stand for a misdeal for the miners in times like these when coal is so important to the vast industrial program."

"As a precautionary measure," however, the United Mine Workers announces in an official circular in the Jan. 1 issue of the *United Mine Workers Journal* an assessment of $1 per month per member for the months of January and February "to provide for the future welfare and security of our membership and our organization."

•

120 Solvay Byproduct Ovens Being Rehabilitated

One hundred and twenty byproduct coke ovens are being rehabilitated by the Semet-Solvay Co. at Ensley, Ala., and will be placed in operation as soon as practicable. The company, which is a subsidiary of the Allied Chemical Corporation, New York, had 240 of these ovens, which were abandoned about 20 years ago, but some of them have been placed in operation recently under a contract to furnish coke to the Tennessee Coal, Iron & Railroad Co. With these additional ovens in operation the company will produce, it is estimated, 500,000 tons of coke annually, and it is understood that the coal for the operation will be furnished by T.C.I., which will receive the entire coke output for its use.

Electrical Advances in Coal Mining Charted At Southern Illinois Group Meeting

COAL-MINING electrical men may have been cheated by the common reference to "mechanical mining," J. H. Edwards, associate editor, *Coal Age*, declared before the Southern Illinois Mining Electrical Group at its Jan. 10 meeting, at the West Frankfort Country Club, West Frankfort, Ill. Because of the prevailing type of power supply, he designated all forms of power mining as "electrical mining." Even the repair of the machines, he said, "is done by arc welding."

Electric mining, said the speaker, began in 1887 with the illumination of picking tables in a breaker of the Hillside Coal & Iron Co. with Thompson-Houston arc lamps. In the same year, an electric locomotive was installed in a mine of the Lykens Valley Coal Co. Only 12 miles from the group's meeting place at Christopher, was installed the first Ward Leonard coal-mine hoist in 1912. Incidentally, Mr. Edwards pointed out, the first armature rewind on this hoist was made in 1939, and the first stator rewind of the flywheel motor was made about the same time. The stator rewind was made with coils which had been carried 17 years as spares. A three-phase induction-motor-driven mining locomotive was put in service in 1911 near Peoria.

Indicative of how far we have come in power generation, Mr. Edwards noted that 0.85 lb. of coal will produce sufficient power to mine 250 lb. of coal. Even so, he said, 70 per cent of the coal burned in the power plant goes up the stack or into the condenser. Nevertheless, mileposts have been left along the way by those brave enough to do new and big things for the first time, some of the records set up indicating the soundness of their engineering and commercial background.

Lists Engineering Milestones

Among the examples cited by the speaker were: 1928—Peabody Coal Co. installed at Mine 53 a large d.c. hoist driven by a synchronous m.g. set, showing 2 or 3 per cent power saving compared with the conventional flywheel-type m.g. set. In the same year the Northern Illinois Coal Corporation put in service an armored cable for a.c. strip-pit distribution; it is still in service.

1929—United Electric Coal Cos. installed the then largest stripping shovel, 15-yd., powered by a 1,700-kva. 0.8 p.f. synchronous motor and weighing about 1,700 tons. This shovel has been modernized with the addition of a 26-yd. dipper and changed hoist gear ratio, increasing the total weight.

1940—Tennessee Coal, Iron & Railroad Co. installed a 3,500-hp. wound-rotor induction-motor hoist at one of its iron-ore slope mines in Alabama. Its job is to pull 35,000 lb. up a 6,000-ft. slope at 4,000 ft. per minute. Dynamic braking is effected by applying d.c. to two leads of the stator after disconnecting the power. Energy is dissipated in the secondary (starting) resistor. Also last year the Tecumseh Coal Co. installed a 35-yd. stripping shovel of the new knee-action design.

Yielding to the prevailing interest in the "biggest," "smallest" and "fastest" things, Mr. Edwards mentioned a few:

The largest three-conductor a.c. cable, installed in the Greenwood shaft, Lehigh Navigation Coal Co., Coaldale, Pa., is of 800,000 circ.mil, 880 ft. long, and weighs 16,644 lb.

In d.c. cables, Old Ben Coal Corporation seems to hold the record for size with 2,000,000-circ.mil concentric two-conductor units. They are supported by the outside (negative) wires, which serve also as an armor for the positive lead. These cables are in boreholes about 500 ft. deep.

Hudson Coal Co. has a mine-drainage

Keeping Step With Coal Demand

Bituminous Coal Stocks

	Thousands Net Tons Dec. 1 1940	P. C. Change From Nov. 1 1940	P. C. Change From Dec. 1 1939
Electric power utilities	11,512	+1.79	+29.96
Byproduct coke ovens	10,091	+3.90	+24.35
Steel and rolling mills	691	+5.50	— 0.15
Railroad (Class 1)	5,778	+5.47	+ 8.16
Other industrials*	14,979	—2.03	+ 3.85
Total	43,051	+1.43	+15.10

Bituminous Coal Consumption

	Thousands Net Tons Nov. 1940	P. C. Change From Oct. 1940	P. C. Change From Nov. 1939
Electric power utilities	4,764	—1.00	+ 8.12
Byproducts coke ovens	6,799	—1.86	+ 3.90
Steel and rolling mills	895	+3.11	—15.12
Railroads (Class 1)	7,593	+3.30	+ 3.81
Other industrials*	11,091	+6.92	+ 0.80
Total	31,142	+2.66	+ 2.97

* Includes beehive ovens, coal-gas retorts and cement mills.

Coal Production

Bituminous

Month of December, 1940, net tons	40,600,000
Per cent increase over Dec., 1939	6.66
January-December, 1940, tons	452,445,000
Per cent increase over Jan.-Dec., 1939	15.17

Anthracite

Month of December, 1940, net tons	4,671,000
Per cent increase over Dec., 1939	19.34
January-December, 1940, tons	50,024,000
Per cent decrease from Jan.-Dec., 1939	2.92

Sales of Domestic Coal Stokers vs. Oil Burners

Sales	Coal Stokers	Oil Burners
November, 1940	10,591	17,626
Per cent incr. over Nov., 1939	25.76	21.07
January-November, 1940	142,825	188,520
Per cent increase over Jan.-Nov., 1939	48.17	20.66

Index of Business Activity*

Latest week	142.5
Per cent drop from month ago	0.35
Per cent gain over year ago	15.29

* *Business Week*, Jan. 18.

Electrical Power Output†

Week ended Jan. 11, kw.-hr.	2,834,512,000
Per cent decrease from month ago	0.98
Per cent increase over year ago	9.29

† Edison Electric Institute.

MINE LUBRICANTS THAT ARE MADE FOR MINE SERVICE

Most equipment used in mines differs from that used in any other industry. That's why Standard Oil has developed special mine lubricants, greases that are designed to stand hard use under dusty conditions, and that give long-lasting service in equipment difficult to lubricate under operation.

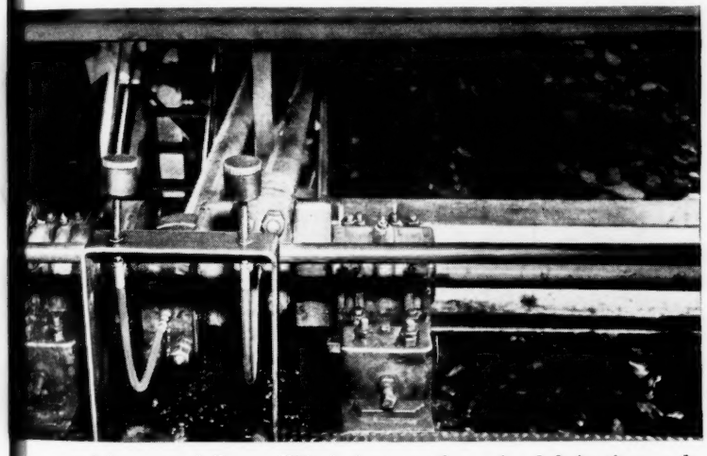
The economy of these special lubricants will be found in reduced maintenance and the saving in labor and shutdown time. Here are some of these lubricants:

SHAKER SCREEN ECCENTRIC BEARINGS LAST LONGER WITH

SUPERLA GREASE

On the basis that "the squeaking wheel gets the grease," shaker screen eccentric bearings have been given a lot of attention in the development of lubricants for tipple equipment.

The severe conditions under which these bearings operate frequently cause them to run hot. Conventional greases will thin out at these high temperatures and leak from the bearings. Unless the bearings are lubricated frequently, which means high consumption, temperatures will continue to rise, causing excessive wear



and frequent failures. This is just another mine lubricating problem which Standard Oil grease technicians have solved with the development of Superla Grease.

In many instances the right grade of Superla Grease has immediately brought bearing temperatures down to normal on troublesome eccentrics without any mechanical change. In two instances grease consumption was cut in half. At one mine, a man had spent most of his time checking eccentric bearing temperatures and greasing the bearings. With Superla Grease this cost, too, was reduced one-half.

OPERATORS FIND LUBRICATION ENGINEERING SERVICE HELPFUL

To help you apply these special mine lubricants correctly, Standard Oil Lubriction Engineers are located throughout the Middle West. These men are thoroughly familiar with your problems. You couldn't hire more competent lubrication experts; yet their service is free. You can reach an engineer through your local Standard Oil (Indiana) office or by writing 910 South Michigan Avenue, Chicago, Illinois. In Nebraska, write Standard Oil Company of Nebraska at Omaha.

CUT POWER BILLS AND LUBRICATION COSTS WITH

STANOLIND MINE CAR GREASE

This is a product that is designed to "kill" three haulage problems at one time, namely: high grease consumption, excessive motive power, and bearing wear.

The quality in Stanolind Mine Car Grease that eliminates these costly items in haulage is called "High apparent viscosity for a given consistency." Simply stated, this means that oils of the right viscosity are combined with the necessary soaps to form a grease that is heavy enough to prevent leakage and wear and yet light enough to allow free turning of the wheel bearings.

To get full advantage of your modern tapered roller bearing mine car wheels try Stanolind. A Standard Oil Engineer will gladly specify the right grade for a trial.

CABLES COST MONEY—SAVE THEM WITH

CALUMET COMPOUND

It might seem that the lubrication of open gears, cables, or wire rope could be handled by any material that was "oily." Actually, the problem involved is almost as complicated as the lubrication of a fine anti-friction bearing.

For proper lubrication, gears, cables, and wire rope require a lubricant that will cling to the gears or rope and resist the high pressures between gear teeth or rope strands. It must also maintain these qualities under widely varying temperatures.

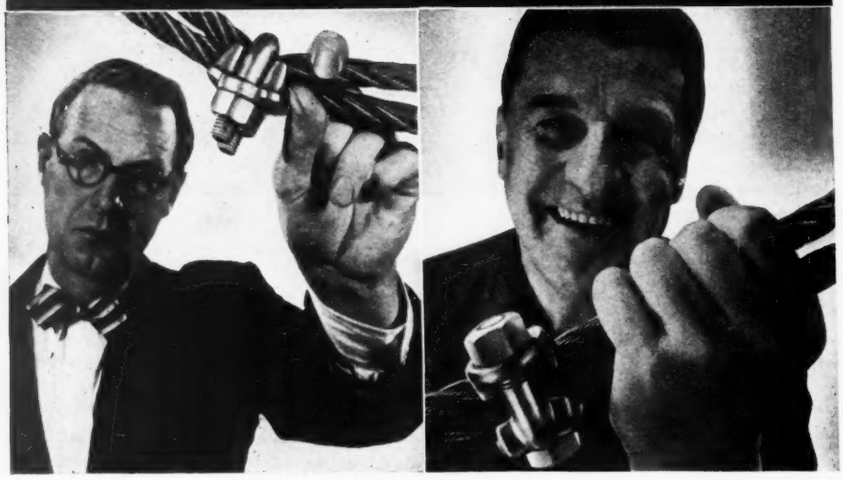
Calumet Compound has been particularly designed for this service. Special oils were selected and an accurate formula developed to produce a grease with unusual tenacity and film strength. Specifications are rigidly followed; and when a Standard Oil Engineer specifies one of the 12 grades of Calumet Compound for your use, you can be sure of getting the same cost-reducing lubricant each time you order.

Copr. 1941, Standard Oil Co. (Ind.)

STANDARD OIL COMPANY (INDIANA)

LUBRICATION ENGINEERING THE RIGHT LUBRICANT • PROPERLY APPLIED TO REDUCE COSTS

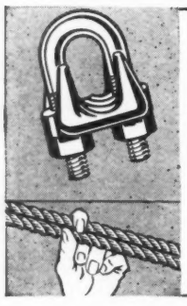
WHICH MAN WOULD YOU HIRE?



Fauntleroy is on the spot. That U-Bolt Clip of his spoils the rope, breaks it and causes costly delays and accidents. Would you put Fauntleroy to work for you with his U-Bolt Clip?

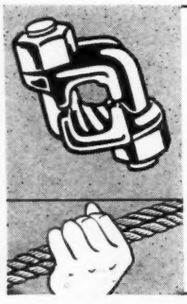
Spike says, "This Laughlin Safety Clip takes a real fist grip on wire rope! Sure it saves time and money. It's safer, easier to put on, and can't be put on backwards!"

WIRE ROPE USERS! HERE'S THE WAY TO INCREASE YOUR PROFITS!



DON'T USE THE "FINGER PINCH"

hard to tighten
can go on backwards
rope breaks
crimps rope
causes accidents



BUY THE CLIP WITH THE "FIST GRIP"

easy to tighten
always on right
holds rope
saves rope
saves accidents

THIS FREE FOLDER Tells How You Can Get Safety And Savings On Your Present Job — And proves, in dramatic competitive clip tests, that the Laughlin drop-forged Safety Clip is twice as strong — delivering 95% of the strength of the rope.

MAIL THIS COUPON TODAY! It will bring you full details of laboratory tests conducted by a world-famous engineering school, a U. S. Government arsenal, and a leading wire rope manufacturer. Positive proof that you can save operating expenses by using the "fist grip" clip! Act now!

WRITE US TODAY USING THIS COUPON

THE THOMAS LAUGHLIN CO.
PORTLAND, MAINE

Please send me free Safety Clip booklet, A-1

NAME .....

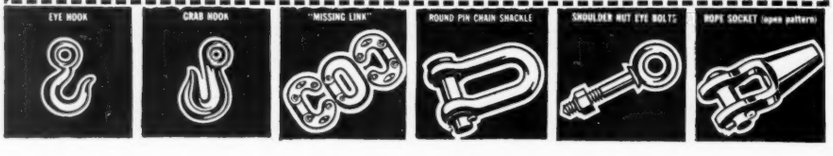
COMPANY .....

ADDRESS .....

CHECK HERE FOR CATALOG ON ITEMS BELOW

☐

Look for Laughlin products in Coal Mining Catalogs and buy through your distributor.



plant using two 1,000-hp. induction motors to drive pumps, which hold the lead for size.

In West Virginia are two 600-hp. synchronous motors driving mine fans. One of these is at the top of a 756-ft. shaft and in parallel with a steam-driven fan. The two fans handle 750,000 cu.ft. of air a minute.

Among mine locomotives with outstanding records, the Berwind-White Coal Mining Co. has a Westinghouse 38-ton single unit. Consolidation Coal Co. has a 40-ton unit consisting of two 20-ton Jeffreys in tandem. Its 11.5 m.p.h. speed is eclipsed by the Hanna Coal Co.'s 21-ton axleless eight-wheel four-motor 21-m.p.h. Differential Steel Car Co. locomotive having a possible speed of 40 m.p.h. Jewell Ridge Coal Corporation has a 15-ton General Electric locomotive only 26 in. high.

The speaker traced the story of drilling rock underground from electric rock drills of the early twenties to the development of better air drills and compressors on down to present high-speed diamond core drill brought out by the Sullivan Machinery Co. Speeds are 1,800-3,600 r.p.m.

Small Mines Increasing

Attention was called to the vast numbers of truck mines of 20-to-500-tons-per-day capacity which have been developed in recent years—most of them of 50 to 100 tons output. The diesel engine, particularly the high-speed type, it was said, was largely responsible for many of these mines having their own generating plants and being electrically equipped. Diesel locomotives, it was pointed out, have been given a clean bill of health for use in some tunnel work. For underground mining service, however, such devices, although promising, would be confronted with a difficult obstacle in meeting U. S. Bureau of Mines requirements for gaseous operations.

The progress of the mercury-arc rectifier and some of its advantages were traced. The polarity of the structure made it desirable to operate the trolley at reversed polarity, but the present trend, said the speaker, is back to the standard positive trolley.

Of newer applications, Mr. Edwards noted that the carrier current telephone is being introduced to establish direct connection with operators on shaft cages and motormen on mine locomotives.

Veering off into the realm of mystery, Mr. Edwards touched on some potential dangers in discussing static electricity. When we think of only the family cat and the fluffy carpet on a frosty morning as potential generators of static electricity, he said,

Permissible Plates Issued

Two approvals of permissible equipment were issued by the U. S. Bureau of Mines in December, as follows:

Jeffrey Manufacturing Co.: Type L-500 loading machine; 50-hp. motor, 250 and 500 volts, d.c.; approvals 415 and 415A; Dec. 30.

American Mine Door Co.: Type H "Dustributor" (rock-dusting machine); 20-hp. motor, 230 volts, d.c.; Approval 416; Dec. 30.

Heads Central Pennsylvania Safety Association

R. D. Joseph, inspector for the Sixth bituminous district of Pennsylvania, snapped at the association's first annual banquet, Dec. 7 at Johnstown, Pa.

we are courting possible disaster. Air leaks, steam leaks, cement guns, even parting rock structures, he warned, may generate sparks sufficient to set off a gas explosion. Reminding his hearers that terrific lightning discharges come from rain clouds, he said it must be realized that dry atmospheres are not necessarily the only condition likely to produce static electricity.

Taking a furtive peep at possible future developments, the speaker noted: (1) A.c. power is taking over the job d.c. has been doing; (2) storage-battery locomotives are contenders for main-line haulage; (3) diesel engines, with carbon-monoxide elimination, are a possibility for mine haulage—the incentive being to rid the mines of trolley wires.

•

New Preparation Facilities

Crozer Coal & Coke Co., Crozer Mine, Elkhorn, W. Va.: Contract closed with Roberts & Schaefer Co. for complete crusher installation for reducing lump to 8x1¼ and 0x¼ in.; capacity, 125 t.p.h.

Hanna Coal Co. of Ohio, Piney Fork, Ohio: Contract closed with Link-Belt Co. for complete washing plant with over-all capacity of 375 t.p.h. of mine-run; washing capacity, 300 t.p.h. through two Link-Belt air-pulsated wash boxes; feed is divided, 6x1¼-in. coal going to one box and 1¼-in.x0 going to the other; equipment includes two-screen-type heat dryers and a centrifugal dryer, the latter, with a capacity of 36 t.p.h. of ⅜-in.x0 coal, supplied by Centrifugal & Mechanical Industries, Inc.

Harry E Coal Co., Swoyersville, Pa.: Contract closed with Menzies Separator Co. for one 8-ft. and two 4-ft. Menzies cone separators to be installed in new cleaning plant; 8-ft. unit will be used to clean egg, stove and chestnut refuse; one 4-ft. unit will be used to clean pea, buckwheat, rice and bar-

COALMASTER

STAGGERED TOOTH TOOLS

for

Post and Machine Mounted Drills

GIVE YOU

Smoother Holes
Straighter Holes
Less Vibration
No Bit Breakage
Less Power Consumption
Less Wear on Augers
Less Drilling Time per Hole

. . . that's what a large West Virginia operator told us

Coordinated production gives the lowest cost, and drilling plays an important part in coordinating the other factors in the cost of production. Where a drill crew does not get its work done according to schedule, an extra demand is placed on management to see to it that the situation is corrected, an extra room or two does not get shot and possibly misses an opportunity to get loaded. The ability to keep the drilling up to schedule at all times, will lower costs.

Placing the holes where they should be will lower costs too. Where they are placed and how they are drilled is governed, as a practical matter, by the "rush" the drillers are in to keep up to schedule. In drilling, as in other things, the line of least resistance is easiest to follow and short cuts are sometime taken that result in poor shooting and lost minutes to the loading machine crew. Costs rise a little here and a little there and it is difficult to fix the blame for it.

The relation of hole size to explosive size, the type and amount of explosive, and the kind of shot wanted is an important subject. A special study of it will usually affect the cost sheet favorably.

We are drilling specialists and our engineers in the field have the background and experience to help you in your drilling problems.

COALMASTER Tools will help you in your fight to lower costs in these directions by enabling the drillers to keep the drilling up to schedule more easily, giving them more time to do their job better. Our line is complete and we can equip you to drill whatever hole size you want. Let us cooperate with you in your 1941 fight to lower these larger factors of cost.

CENTRAL MINE EQUIPMENT CO.
4520 Enright Ave., St. Louis, Mo.

Send us your folder on COALMASTER Tools for Blast Hole Drilling

Name ..... Title .....

Company .....

Location .....

ley refuse; the other to clean No. 4 buckwheat; the three units will have a total cleaning capacity of 114 t.p.h.

Island Creek Coal Co., No. 20 Mine, Holden, W. Va.: Contract closed with Roberts & Schaefer Co. for complete Stump Air-Flow cleaning plant to clean ¼-in.x0 slack; capacity, 100 t.p.h.; to be completed May 1.

Morris Run Coal Mining Co., Morris Run, Pa.: Contract closed with Roberts & Schaefer Co. for Stump Air-Flow cleaning units to clean ¾-in.x0 slack; capacity, 100 t.p.h.; to be completed April 1.

Page Coal & Coke Co., Page Mine, Pageton, W. Va.: Contract closed with Roberts & Schaefer Co. for complete crusher installation to reduce mine-run, egg and smaller sizes at rate of 200 t.p.h. to produce ⅝x¼-in. pea and ¼-in.x0 slack.

Peerless Coal & Coke Co., Peerless Mine, Vivian, W. Va.: Contract closed with Roberts & Schaefer Co. for complete crusher installation to crush 3-in.x0 coal at rate of 325 t.p.h., provision being made to load ⅜x¾ pea and ⅜-in.x0 slack.

Rosedale Coal Co., Morgantown, W. Va.: Contract closed with Fairmont Machinery Co. for river loading facilities; capacity, 125 t.p.h. of slack and pea to river barges; also bin for trucking of these two sizes; to be completed about March 1.

•

Personal Notes

John Alderson, mine foreman at Westland mine of the Pittsburgh Coal Co., Westland, Pa., has been made assistant to the superintendent.

E. A. Amundsen has been appointed district engineer in charge of the Birmingham (Ala.) office of the U. S. Bureau of Mines, vice Frank E. Cash, transferred.

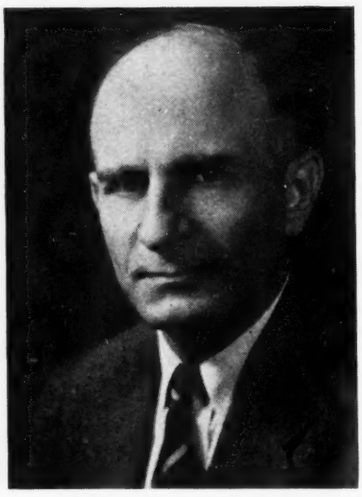
Frank E. Cash, engineer in charge of the Birmingham (Ala.) district, U. S. Bureau of Mines, for the last 15 years, has been transferred to the Duluth (Minn.) office of the Bureau, effective Jan. 23. Taking charge of the Birmingham office in 1925, Mr. Cash made a commendable record in mine and industrial safety work, being held in high esteem in the district.

John G. Cline, formerly with the Boone County Coal Corporation, Sharples, W. Va., is now with the Rochester & Pittsburgh Coal Co., Indiana, Pa., as supervisor of maintenance.

R. D. Cullen, formerly in the product control department of the Pittsburgh Coal Co., has been named production scheduler.

Russell C. Fleming has been appointed editor of *Mining Congress Journal*. He succeeds Richard J. Lund, who has been appointed an executive in the raw materials division of the National Defense Advisory Commission. Mr. Fleming, an alumnus of the University of Illinois, has been active in engineering and vocational work.

David Francis, section foreman at Baltimore No. 5 colliery of the Hudson Coal Co., Parsons, Pa., was honored at a dinner Jan. 14 to commemorate his retirement after 62 years of service with the company. He is 76 years old.



New "Consol" Manager

W. L. Doolittle, who has succeeded the late W. J. Wolf as general manager of operations for the Consolidation Coal Co.

L. Ebersole Gaines, president of the New River Co., has been elected president of the West Virginia Coal Association, succeeding J. G. Bradley, president, Elk River Coal & Lumber Co. Laurence E. Tierney Jr., president, Eastern Coal Corporation, has been named vice-president to succeed Dr. Gory Hogg. D. Holmes Morton, president, Winifrede Collieries, has been chosen treasurer in place of C. C. Dickinson, Jesse V. Sullivan has been reelected secretary.

H. A. Glover has been elected vice-president of the Island Creek Coal Sales Co., Huntington, W. Va. He had been directing sales for Island Creek and allied companies for five years in his former capacity as assistant to the president of Island Creek Coal Co. and Island Creek Coal Sales Co.

Coming Meetings

- American Institute of Mining and Metallurgical Engineers: annual meeting, Feb. 17-20, Engineering Societies Building, New York City.
- Canadian Institute of Mining and Metallurgy; annual meeting, March 10-12, Windsor Hotel, Montreal, Canada.
- Utah Coal Operators' Association: annual meeting April 2, 709 Tribune Telegram Building, Salt Lake City, Utah.
- Midwest Power Conference: April 9 and 10, Palmer House, Chicago.
- American Mining Congress: eighteenth annual coal-mining convention and exposition, April 28 to May 3, Cincinnati, Ohio.
- Stoker Manufacturers' Association: annual meeting, May 26 and 27, White Sulphur Springs, W. Va.
- Mine Inspectors' Institute: annual meeting, June 2-4, Bluefield, W. Va.

James E. Hart, for the last ten years secretary to the president of the Island Creek Coal Co., has been made manager of the newly created coal-trade association department of the company.

John P. Howell has been transferred from the Pittsburgh (Pa.) office of the Koppers Coal Co. to be engineer in charge of cost and production in the company's Houston division with headquarters at Kimball, W. Va.

W. E. Housman has been appointed staff engineer by the H. C. Frick Coke Co., vice L. J. King. His headquarters will be in Pittsburgh, Pa.

Herbert B. Husband was made manager of the Kentucky division of the Consolidation Coal Co. on Jan. 15, succeeding T. W. English, who resigned on Jan. 1. Mr. Husband had been connected with operation of Chesapeake & Ohio Ry. coal properties since 1921.

George H. Jenkins, general fuel agent, Canadian National Railways, has retired at his own request after more than 50 years of service. He is succeeded by S. C. Welby, hitherto assistant general fuel agent.

Dennis Keenan, fifteenth bituminous district (Pa.) inspector, was reelected president of the Mining Institute of the Fifteenth Bituminous District at its annual meeting. J. G. Nicholson, superintendent, No. 17 mine, Pennsylvania Coal & Coke Corporation, was renamed treasurer, and C. P. Brinton, chief engineer, Barnes & Tucker Co., was again named secretary.

Frederic L. Kirgis, first assistant solicitor of the Department of the Interior and Consumers' Counsel for bituminous coal, has resigned to accept a position with the Department of Justice as Special Assistant to the Attorney General.

R. M. Marshall, vice-president of the Woodward Iron Co., Woodward, Ala., for the last five years and previously vice-president and general manager of the Sloss-Sheffield Steel & Iron Co., has resigned and accepted a position with the Pittsburgh Coke & Iron Co. as executive vice-president. He went to the Birmingham district seven years ago from Pittsburgh.

T. L. McCall has been appointed general manager of the Dominion Coal Co. and the Cumberland Railway & Coal Co., Sydney, N. S., Canada. Mr. McCall, who retains his post as Dosco's chief mining engineer, went to Canada from the Federated Malay States in 1921. He succeeds H. J. Kelley, vice-president, whom it was sought to free of some of his responsibilities to enable him to devote more effort to the war cause.

Charles M. McConnell, for the last twelve years engineer and assistant superintendent for the Moffat Coal Co., Oak Creek, Colo., has been engaged as an engineer by the United States Fuel Co., Hiawatha, Utah.

Eugene T. Moroni has joined the staff of engineers of the Island Creek Coal Co. at Holden, W. Va.

Frank E. Mueller has been elected president of Roberts & Schaefer Co., Chicago, effective Jan. 1.

HARLAN OEHLER, preparation manager for the Franklin County Coal Corporation, Herrin, Ill., has resigned to become production engineer for the Bixby-Zimmer Engineering Co., with headquarters at Galesburg, Ill.

WILLIAM J. RICHARDS, chairman, Sovereign Pocahontas Co., has been elected president of the Pemberton Coal & Coke Co., Affinity, W. Va., to fill the vacancy caused by the death of his son, William A. Richards.

EDMUND J. TAFT has been appointed vice-president of the Central Fuel Corporation, Chicago. He joined the company more than four years ago, previous to which he was connected with the sales department of the Chicago, Wilmington & Franklin Coal Co. for fifteen years.

HUGH TURNER has been promoted to night foreman at No. 2 mine of the Boone County Coal Corporation, Monclo, W. Va.

JOHN J. VINTON, lately assistant to the superintendent at Westland mine of the Pittsburgh Coal Co., Westland, Pa., has been promoted to superintendent.

J. PIERRE VOGEL, formerly vice-president of Heyl & Patterson and more recently with Link-Belt Co., has opened an office in the Oliver Building, Pittsburgh, Pa., as a consultant in coal handling and preparation.

W. W. WALKER, hitherto vice-president of the Ashland Coal & Coke Co., Ashland, W. Va., and the Majestic Collieries Co., Majestic, Ky., has been elected president of these companies, vice William A. Richards, deceased.

WILBERT WEBSTER, for the last ten years with the National Coal Association at Washington, has joined the Island Creek Coal Co., Huntington, W. Va., as chief clerk in the office of the president, also succeeding to the secretarial duties formerly performed by James E. Hart, promoted.

JEROME C. WHITE, for several years chief engineer of the Hanna Coal Co. of Ohio, has joined the Heisley Coal Co., Nanty Glo, Pa., as assistant chief engineer.

•

St. Lawrence Project Unsound, Madeira Declares

Louis C. Madeira 3d, executive director of the Anthracite Institute, declared that "construction of the St. Lawrence seaway project will not aid this nation in peace or war but will, instead, impose a heavy financial burden on the taxpayers at a time when every energy and resource should be directed to furtherance of the national preparedness program," speaking Jan. 9 at a luncheon at the Hotel Biltmore, New York City, in connection with the annual meeting of the Atlantic States Shipping Advisory Board. Mr. Madeira emphasized that the anthracite industry concurred wholeheartedly in a statement along similar lines by R. V. Fletcher, general counsel of the Association of American Railroads, principal speaker at the luncheon.

The attitude of the Anthracite Institute toward this project, Mr. Madeira added, had

HOW THESE TIES GOT 4 NEW LIVES IN TEN YEARS

MAKE THE CZC FACTOR OF SAFETY WORK FOR YOU!

THESE 3"x5"x5½ ft. room ties were treated with zinc chloride about ten years ago to prevent decay. In re-use for the fourth time, the ties are moved sideways each time to spike in new timber. After four cycles, the ties are turned over and the same practice repeated.

Timber can be multiplied in life from 3 to 10 times by treatment with the improved Du Pont CZC (Chromated Zinc Chloride). And this treatment gives the plus advantages of timber that's fire retardant, clean and odorless, permitting safety in handling . . . and avoiding confusing odors foreign to mines.

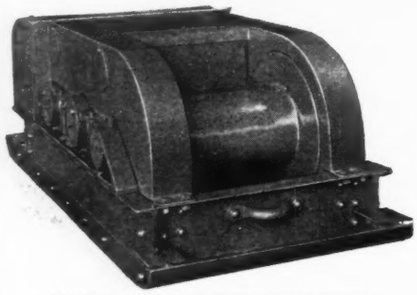
You'll find CZC treatment a wise investment for cribbing, lagging, shaft timbers, air course timbers, haulage way ties, fire stops. Send today for our free booket, "Wood Preservation for Mines." Then put the CZC Factor of Safety to work . . . saving money for *you!* E. I. du Pont de Nemours & Co. (Inc.), Grasselli Chemicals Department, Wilmington, Delaware.

SPECIFY LUMBER TREATED WITH

DU PONT REG. U.S. PAT. OFF. **CZC**

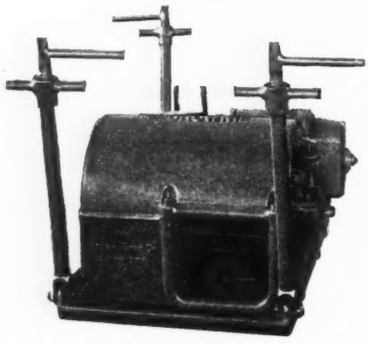
CHROMATED ZINC CHLORIDE

PROFIT GETTERS IN PRODUCTION!



MODEL HKL CAR SPOTTING HOIST

Low seam type, 24" overall height, rated 6000 lbs. rope pull. For handling trips of cars at loading stations.



HGD CONVEYOR AUXILIARY HOIST

Used for dragging conveyor sections and supplies up to the working point. Portable, easily handled.

MODEL BC TUBING BLOWER

A sturdy compact unit having a high capacity through long lengths of tubing. Convenient, portable, electric blower for auxiliary ventilation.

● Increased efficiency — less wasted time — is a sure way to lower costs. Accurate spotting of cars at loading points—rapid changing of trips—conveyor setups moved in less than one-half the former time—plenty of fresh air at the face with prompt clearing of dust and fumes — these are yours with "BROWNIE" hoists and blowers.

As "first aids" to fully mechanized mining, these three "BROWNIE" machines are indispensable in truly *modern* underground service. Each unit requires a minimum of space and operating attention . . . yet assures a maximum of safety, ability and economy in spotting cars, moving equipment, or auxiliary ventilation.

WRITE TODAY—

—to get your free copies of the latest literature on the Brown-Fayro Line, designed and built especially for the Coal Mining Industry . . .

MINE CARS and WHEELS
HOISTS • BLOWERS
RETARDERS • PUMPS
OIL SPRAY SYSTEMS
SHEAVES • RERAILERS

THE BROWN-FAYRO COMPANY
940 ASH ST. JOHNSTOWN, PA.

been the subject of official action by the directors of the institute more than two years ago in the form of a resolution of opposition. "The project will benefit only a very small section of the country," he added, "but 90 per cent of the burden of the cost will fall on those who will be damaged by the construction and operation of this project.

"The seaway portion of the project, if at all of any practical value, would not be of any use from December until the middle of April, due to ice conditions on the Great Lakes. This would mean that, considering the distances which a shipper would have to travel by this route, coupled with weather conditions, the seaway would be usable commercially for only 42 per cent of the year. The railroads can function twelve months per year regardless of weather and still the railroads as taxpayers would be called upon to contribute a substantial share of the maintenance of the seaway should this administration project be saddled on the shoulders of the taxpayers and further add to their already staggering burden."

●

Processing of Large Utah Coals Feasible, Report Reveals

Results of a four-year study of low-temperature carbonization of Utah coals by the Utah Conservation and Research Foundation, a State non-political and non-profit agency, are revealed in an 872-page report released by the foundation. This report, made at the request of and for the benefit of the State Legislature, indicates that commercial low-temperature carbonization of Utah coals is economically feasible in the larger sizes but recommends erection of a semi-commercial plant and research laboratory for tests of processes on a commercial scale. Legislative measures toward that end have been drafted for submission to the Utah Legislature, now in session.

A major anti-smoke movement in Utah, centering chiefly about "smog"-bound Salt Lake City, resulted in creation of the foundation by legislative action in 1937. The agency was granted an appropriation of $25,000 and commissioned to investigate thoroughly processes for the low-temperature carbonization of Utah coals. Principal findings of the research work are summarized as follows in the foundation's report:

"1. The most suitable processes for the manufacture of semi-coke in sizes from slack to pea or somewhat larger sizes from non-coking bituminous Utah coals are the Rexco and N.F.C. [National Fuels Corporation] processes. The estimated Salt Lake City delivered prices of semi-coke from these products are $6.93 and $6.74 per ton, respectively.

2. The most suitable process for the manufacture of semi-coke in briquetted form from non-coking bituminous Utah coals are the Hayes and N.F.C. processes. The estimated Salt Lake City delivered prices of semi-cokes from these processes are $7.75 and $7.64 per ton, respectively.

"3. The production of semi-coke in small sizes from bituminous Utah coals is not considered to be economically sound because the estimated delivered prices of the carbonized fuels are greatly in excess of the present delivered prices of raw slack coal. Ac-

cording to the data obtained, the most economical coal for the production of semi-coke in small sizes is the sub-bituminous coal of the Coalville area.

"4. The Hayes process is the most suitable method for the manufacture of semi-coke in small sizes from sub-bituminous Utah coal. The estimated Salt Lake City delivered price of semi-coke from this process is $5.77 per ton. The Wisner process may also be suitable on the basis of confidential cost data which have been withheld from publication at the request of the Pittsburgh Coal Carbonization Co., which controls the process.

"5. The continuous sale of tar at a minimum price of 4c. per gallon at the plant is necessary to insure the economic success of a low-temperature carbonization plant in Utah. However, failure to sell the fuel gas would increase the price of semi-coke not more than 50c. per ton.

"6. The quantity of tar, light oil, and fuel gas produced from a 500-ton-per-day low-temperature carbonization plant at Salt Lake City would not be sufficient to cause a great disturbance in the normal operation of the established oil-refining and gas-distributing companies."

Erection and operation of a semi-commercial plant using retorts of commercial size was recommended as the next logical step. The plant should be located at Salt Lake City and operated continuously for a period of at least one year, the foundation directed, to determine the nature and extent of profitable markets for semi-coke, to determine the operating costs and best operating technique for each of the commercial processes, and to determine the yields of and develop profitable markets for the byproducts of tar, light oil and fuel gas.

Research "Lab" Proposed

Establishment of a research laboratory in conjunction with the plant to serve as a testing and proving ground and to develop new coal-tar products also was recommended.

Dr. J. L. Gibson, dean of the School of Arts and Sciences at the University of Utah, is president of the foundation and chairman of its executive committee. Dr. R. B. Ketchum, dean of the School of Mines and Engineering at the university, is chairman of the committee on laboratory research. A staff of twelve was employed by the agency, and State departments cooperated in the technical work.

The comprehensive report consists of nine parts: Two parts summarizing all available published data on low-temperature carbonization and on the carbonization of Utah coals; laboratory investigations and carbonization studies undertaken by the foundation; a survey of processes for low-temperature carbonization; a report on technical and economic factors involved in the carbonization of Utah coals; a description of apparatus and procedures; a review of patents, and bibliographies, and an appendix.

Research workers of the foundation submitted seven representative Utah coals to thorough chemical and physical tests, the results of which are embodied in the report. Samples of the coals were submitted to plants using most of the 18 major carbonization processes reviewed, and the results were outlined in detail.

Bureau Makes Report on Nelms Disaster; Offers 35 Safety Recommendations

AN IGNITION of gas from a faulty mining machine or electric drill caused the explosion on Nov. 29, 1940, at the Nelms mine of the Ohio & Pennsylvania Coal Co., near Cadiz, Ohio, which resulted in the death of 31 men, the Bureau of Mines informed Secretary of the Interior Harold L. Ickes on Jan. 13, following receipt of a detailed report of the disaster made by four Bureau of Mines engineers who had assisted in the rescue work and recovery operations. The explosion, according to the report, was restricted, fortunately, to one section of the mine, thus permitting 104 men working in other sections to escape unaided.

Evidence obtained by the Bureau's investigators disclosed that the mining machine and the electric drill, both of the "permissible" type of mining machinery, were in a "nonpermissible" condition at the time of the explosion due to the fact that numerous bolts were missing.

After calling attention to the fact that the Nelms mine is a very "gassy" operation, the Bureau's report also discloses that ventilation in the mine was not sufficient to keep the place where the explosion occurred clear of dangerous accumulations of gas, and that this situation was likely to be aggravated by carelessness in failing to keep ventilating doors closed. Furthermore, although the Nelms mine, which is a highly mechanized mine, was operated with a higher regard for safety than the average coal mine, numerous pieces of machinery were permitted to fall into a "nonpermissible" condition.

Four Bureau Engineers Sign

The Bureau's report, signed by J. J. Forbes, supervising engineer; G. W. Grove, district engineer; C. W. Owings, mining engineer; and J. Westfield, Jr., assistant mining engineer; and approved by Dan Harrington, Chief of the Health and Safety Branch, gives the following as the probable cause of the disaster:

"It is the opinion of the Bureau of Mines investigators that the explosion occurred at or near the face of Room 13 off 8 east aircourse by the ignition of explosive gas; that the accumulation of gas occurred as a result of gas given off during drilling and cutting operations and insufficient ventilation to dilute and carry away the explosive gas, which may have been caused by a derangement in ventilation; and that the source of ignition was an electric arc or spark from a nonpermissible drill or mining machine, both of which apparently were in operation at the time of the explosion. Of these two, the drill appears to be the more likely cause of the ignition. It is further believed that coal dust aided in the propagation of the explosion."

The Bureau's investigators pointed out that the Nelms mine was a highly mechanized mine and operated in three shifts, therefore calling for extra precautions. The rapid advancement of mine working faces with mechanical mining, according to the Bureau, results in an increased liberation of gas and an increased quantity of dust in any given period or place. Therefore, in order to provide reasonable protection for employees, it is necessary that there be relatively large quantities of air in circulation at all times, especially at and near the working faces to dilute and render harmless the gas which is liberated, and that effective measures be taken to allay the coal dust at its source.

Permissible equipment, according to the Bureau's engineers, will provide little or no protection against ignitions of gas if the equipment is not properly maintained, and may even be more hazardous than open equipment in that it may give a false sense of security.

Propagation or extension of explosions cannot be prevented unless all openings in the mine are at all times adequately rock-dusted to within 40 ft. of the face. One of the reasons why the explosion area in this mine was not rock-dusted as it should have been may be that there was not sufficient time between shifts when triple-shifting is done.

The report makes the following recommendations in the belief that their adoption will materially lessen the chances of an explosion occurring in this mine in the future:

Ventilation

"1. The fan should have adequate capacity to provide enough air to ventilate the mine.

"2. Main air courses should be kept free of obstructions at all times so that sufficient air will be delivered to each working section.

"3. Sufficient splits of air should be provided so that not more than one section of working unit will be on one split of air.

"4. Stoppings on face and butt entries should be tightly constructed of incombustible material.

Electricity

"1. Trolley wires and bare feeder wires should not be installed in the mine in other than pure intake air; (a) air which has not passed through or by any active workings and (b) air which has not passed through or by any inactive workings, unless these are sealed effectively; and (c) air which is free from poisonous gas and by analysis contains not less than 20 per cent oxygen (dry basis) and not over 0.05 per cent of inflammable gas; nor should they be installed past open rooms, whether working or abandoned, or in entries or other workings which act as return for open active or inactive workings.

"2. All electrical equipment used at or near the face of the workings, such as mining machines, loading machines, drills, and pumps, should be of the permissible type and this equipment should be maintained in a permissible condition. Such equipment should be connected at its source of power by means of permissible junction boxes. When trailing cables fail, they should be replaced by standby cables, and the defective cable should be taken to the surface to be repaired. A separate ground wire should be provided for mining machines, loading machines, and drills.

"3. Gathering and haulage locomotives when operated in other than pure intake air should be of a permissible type.

"4. Electric pumps should be installed in pure intake air wherever possible. When it is necessary to install pumps on return air, they should be of the permissible type and

should not be started or stopped until an examination of the surrounding air indicates that an explosive mixture of methane and air is not present.

"5. All permissible electrical equipment should be inspected daily by a competent person, and a written report made on the condition of such equipment. It should be the duty of the person making the inspection to see that (a) such equipment is maintained in a permissible condition, and (b) that it is not used in a nonpermissible manner. All permanent cable splices should be vulcanized, and all major repairs to electrical equipment should be done in the shop, preferably on the surface.

"6. The unit foreman should test for gas at least every 15 minutes during cutting and drilling of the coal. If this is not possible, then the machineman or driller should be required to have a fireboss' certificate of competency or equivalent, and he should test for gas after sumping into the coal, cutting across and pulling out of the kerf, as well as before and after drilling each hole in the coal.

Dust

"1. Provision should be made for applying water on the cutter bars of all mining machines. The practice of applying water on the cutter bars of mining machines should be continued to the extent that the coal cuttings will be thoroughly wetted as the cutting is being done.

"2. All working places should be thoroughly wetted with water in the face regions before and after blasting.

"3. Water should be applied to the coal as it is being loaded by the loading machine.

"4. The tops of loaded cars should be thoroughly wetted in the working places to avoid the distribution of coal dust along haulage roads.

"5. The coal face and the working place 40 ft. therefrom should be kept free of coal dust by the use of water.

"6. Consideration should be given to the use of wetting agents to increase the efficiency of the water in allaying the dust.

"7. To prevent the coal from shaking off the cars along the haulage road and being ground to dust, the coal cars should not be overloaded.

"8. Haulage entries should be kept free from spillage of coal and deposition of float dust. At places where haulage entries are excessively dusty, provision should be made to sprinkle or wet the floor.

"9. Rock dust should be applied to every mine surface, including haulage entries, trackless entries, return airways, rooms, and pillar workings to within 40 ft. of the working faces if water is used. If water is not used in working places, rock dust should be maintained to within one cut of the face.

"10. The rock dust should be applied to the roof, ribs, floors, timbers, and other mine surfaces in such quantities that the incombustible content will be not less than 65 per cent at all times without the presence of gas, and for each 0.1 per cent of gas present in the air current, 1.0 per cent additional rock dust should be added.

"11. Dust samples should be collected at frequent intervals at designated points in the mine to maintain a check on the condition of the dust as to explosibility. Redusting should be done before the incombustible content falls below a safe limit, as stated in the preceding recommendation.

"12. Return airways, trackless entries, and rooms that have not previously been rock-dusted should be cleaned of fine coal dust before rock dust is applied.

"13. Provision should be made in stoppings between the intake and return airways to convey rock dust into the returns by means of the hose of a high-pressure rock-dusting machine or any other adequate method. Air-tight trap doors or capped pipes in the stoppings are suggested if a high-pressure rock-dusting machine is used.

Explosives and Blasting

"1. The use of permissible explosives should be continued, but they should be charged and fired in a permissible manner, as follows:

"a. That the explosive is in all respects similar to the sample submitted by the manufacturer for test.

"b. That electric detonators (not fuse and detonators) are used of not less efficiency than No. 6, the detonating charge of which shall be 1 gram of a mixture consisting by weight of 80 parts of mercury fulminate and 20 parts of potassium chlorate (or their equivalents), and that the required electric firing must be done by means of a permissible-type blasting unit.

"c. That the explosive, if frozen, shall be thawed thoroughly in a safe and suitable manner before use.

"d. That the quantity used for a shot does not exceed 680 grams (1½ lb.), and that it is properly confined with clay or other incombustible stemming (from the explosive to the collar of the hole).

"e. That the diameter of the cartridge used must be not less than that designated in the column 'Smallest permissible diameter.'

"f. That the shot is not fired in the presence of a dangerous percentage of firedamp.

"g. That the shot is not a dependent shot, is not bored into the solid, and does not have a burden so heavy that the shot obviously is liable to blow out.

"h. That the explosive be stored under proper conditions so that it does not undergo change in character.

"2. The unit foremen, who also serve as shotfirers, should be required to examine all places for explosive gas and other dangers before and after firing each shot, and no shot should be fired in any place if gas is present in sufficient quantities to be detected with a flame safety lamp.

"3. Because of the large amount of explosives required for one day's supply, it is recommended that the explosives and detonators be stored in separate crosscuts.

"4. Rigid boxes made of wood or some other rigid dielectric material should be used for carrying explosives to the working places.

"5. Detonators and explosives should not be carried to the face by the same man at the same time.

"6. Each hole should be charged and fired separately; the practice of charging several holes before firing a shot is definitely hazardous and should be discontinued.

"7. Shunts or short circuits of detonator leg wires should not be removed until just before the blasting cable is attached.

"8. Holes should not be drilled deeper than the cut, nor should they be drilled before the place is undercut.

General

"1. A mine-rescue station containing at least 10 sets of oxygen breathing apparatus, gas masks, and gas-detecting devices, supplies, and accessories should be provided at the mine to be readily available for emergency use.

"2. A number of selected employees should be given a course of instructions in the use and care of oxygen breathing apparatus and in rescue and recovery operations. Employees trained in this work should be given additional training monthly, and all employees should be given a course in first-aid.

"3. The check-in-and-out system now in use should be continued.

"4. A periodic systematic search for smoking material, matches, patent lighters, etc., should be made at frequent intervals."

"The management of the Nelms mine," the report continues, "is to be commended on the use of permissible electric cap lamps, flame safety lamps and explosives, and for the use of protective caps by the employees. It is also to be commended on the use of insulated explosives cars, the sealing of abandoned areas with bleeder pipes and seals on the return air, the development of the mine so as to segregate the three producing sections (which may have prevented additional loss of life), the rock-dusting which has been done, and the periodic selection and analyzing of air samples in the main returns; also, upon the employment of a safety inspector whose full time is devoted to problems in connection with ventilation, an efficient checking system, and the practice of applying water on the cutter bars of mining machines, all of which are commendable practices."

Some Practices Condemned

Although the investigators do not believe that blasting entered into the cause of the disaster at the Nelms mine, the report condemns both the practice of drilling holes (for explosives) at the same time that the coal is being undercut with possibility of drilling deeper than the cut, and the practice of charging several holes before a shot is fired rather than charging and firing the shot in each hole successively.

The method of mining at the Nelms mine, consisting of drilling a number of holes in a short space of time and while undercutting is being done, closely followed by blasting, also creates a hazard from a sudden liber-

Rules Followed at Nelms

Practically all of the recommendations made by the U. S. Bureau of Mines to minimize the chances of another explosion at Nelms were in effect at the mine at the time of the disaster in Nov. 29, 1940, according to J. C. Nelms, vice-president, Ohio & Pennsylvania Coal Co. The recommendations not in effect, said Mr. Nelms in a statement to *Coal Age*, are now being studied by the management.

ation of methane which could be carried by the air current over the nonpermissible locomotives and over tracks that are not bonded, increasing the liability of ignition from electric arcs and sparks. These conditions, according to the report, greatly increase the explosion hazard.

U. S. Bureau Investigates

Eleven members of the Pittsburgh staff of the Bureau of Mines (including the four engineers who signed the report) carried on the rescue and recovery operations at the Nelms mine in cooperation with officials of the Ohio Division of Mines and the officials of the mining company. Conditions were extremely hazardous during recovery operations. The roof of the mine was badly broken and presented a constant danger. The gas concentrations in the air, even after ventilation was fairly well restored, were high, necessitating working without taking chances even with flame safety lamps in some instances. Large quantities of fallen rock had to be removed with mechanical loading machines before some of the bodies could be uncovered and taken out.

Property damage was extensive and costly. According to the report, much expensive equipment was buried and damaged by falls of rock. It is reported that the section of the mine which was affected may not be reopened, except to recover equipment. The rest of the mine resumed operations on Dec. 16, 1940.

•

Refinancing Plan Announced By Pittsburgh Coal Co.

The Pittsburgh Coal Co. announced on Jan. 3 that its entire issue of 6 per cent debenture bonds now outstanding, totaling $9,831,000, would be called for redemption Feb. 1 at 105 plus interest. The refunding, according to Ernest F. Rumpf, finance vice-president, is to be financed through an issue of $9,000,000 in notes maturing serially over a seven-year period and bearing 3¼ per cent interest. He said the company would save about $170,000 annually on interest and other charges over the seven-year period.

•

New Mines Committeemen Named By New Congress

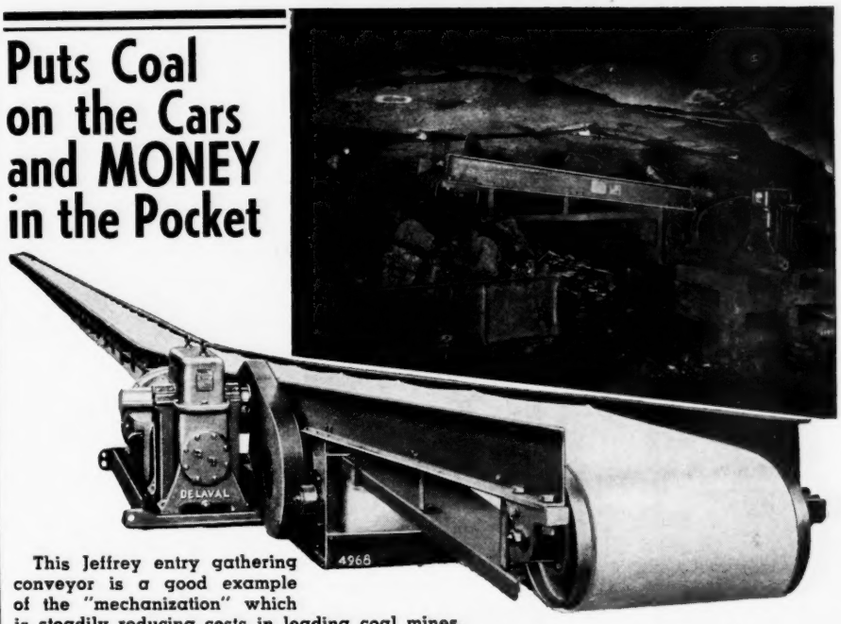
New Mines and Mining Committee members have been named by the new Congress as follows: Senate—Bunker, Nevada; Wallgren, Washington, and Kilgore, West Virginia, all democrats. House—Beiter, New York; Fitzgerald, Connecticut; Kelley, Pennsylvania; Domengeaux, Louisiana, all democrats, and Marcantonio, New York, American Labor.

•

U.M.W. Agent at Kentucky Mines

United Mine Workers, District 23, was cited by the National Labor Relations Board on Dec. 26 as the sole bargaining agent of production employees at Mine No. 3 and

Puts Coal on the Cars and MONEY in the Pocket



This Jeffrey entry gathering conveyor is a good example of the "mechanization" which is steadily reducing costs in leading coal mines. Power and upkeep expenses are kept down by driving the conveyor through a

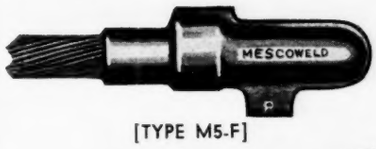
DE LAVAL WORM GEAR

This enclosed, self-lubricated speed transformer is particularly applicable wherever dust and moisture are prevailing conditions. The only attention required is occasional inspection of the oil level.

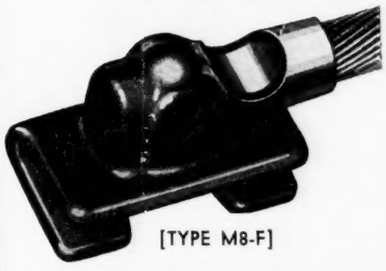
Ask for booklet W-1124, "Worm Gears in Industry".

DE LAVAL WORM GEAR DIVISION
of the De Laval Steam Turbine Company, Trenton, N. J.

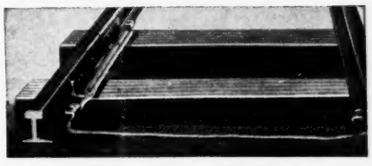
Use MESCOWELD RAIL BONDS *for* **ECONOMY • EFFICIENCY**



[TYPE M5-F]



[TYPE M8-F]



[TYPE M8X-F]

Because they are manufactured by the patented Flashweld Process, Mesco Rail Bonds have greater welded strength, and lower resistance than ordinary bonds.

TYPE M5-F—For use on top of any size rail base. Outer ledge of terminal affords extra welding area, makes welding easier, faster.

TYPE M8-F—Greater welding area for permanent installation. For temporary work this bond can be welded on ends of lugs. It can then be removed easily by sledge and cutter and re-used at full value many times. Can also be reversed by putting terminal sockets on upper side of rail.

TYPE M8X-F—Combination joint and cross bond. Saves a mine weld on each bond installed, at the same time makes a 3 point contact, insuring better conductivity.

Be sure your bonds are Mescoweld Bonds. Write for complete information.

SHIPMENTS MADE SAME DAY ORDERS RECEIVED. OUR DISTRIBUTORS IN ALL IMPORTANT COAL CENTERS CARRY SUBSTANTIAL STOCKS.

MOSEBACH
ELECTRIC & SUPPLY COMPANY
1115 Arlington Avenue Pittsburgh, Pa.

Luton mine of the Providence Coal Mining Co., Providence, Ky. The board's action was based on a secret ballot election of Dec. 5 in which 121 votes were cast for and 97 against the U.M.W.

•

United Electric Expands

United Electric Coal Cos. is expanding washery facilities at its Fidelity mine, Duquoin, Ill. Koppers, builder of the plant, has added a new 50-liter liquid oxygen plant, serving the double purpose of meeting increased needs and providing standby service.

A two-pit stripping operation, pit No. 1 has been equipped with seven 20-ton Autocar diesel-driven trucks to supplement track haulage. The trucks are side dumpers. The loading platform is of five-car length with a ramp at each end. There is a loading track on each side of the platform. A new shop also has been provided to house and service the trucks.

•

Middle States Fuels Forms Fuels Division

Middle States Fuels, Inc., a marketing agency handling the sale and distribution of coal produced in the Fulton County (Ill.) district, announces the establishment of a research and engineering division in which special attention will be given to problems in fuel engineering and coal utilization.

G. A. Brady, formerly research assistant in the Mineral Industries School of Pennsylvania State College, has been placed in charge of the new division. He is a graduate of the State University of Iowa and also the University of North Dakota and received a Ph.D. in fuel technology at Penn State.

•

Illinois Governor Urges Peace: Edmundson Offers to Quit

Governor John Stelle of Illinois on Jan. 6 called upon William Keck, district president of the Progressive Miners, and Ray Edmundson, district president of the United Mine Workers, to use their influence to bring about a peaceful settlement of union difficulties reported at a Springfield mine. The Governor's letter follows:

"The Springfield newspapers of Sunday, Jan. 5, carried articles describing alleged difficulties between the two Illinois mine unions in connection with the operation of a Springfield mine. The articles stated that force was being exerted in an effort to coerce some of the workers.

Ray Edmundson

"I am sure that as head of the unions involved in this alleged controversy you will keep the pledge you made to the people of the State of Illinois to settle all differences in a peaceful and American way.

"As governor of the State of Illinois, I want you to know that nothing will deter me from the use of the forces of State government to bring about such a settlement if the mine unions fail to keep their pledge."

At a rally held the same day to celebrate the pardoning of "five Duquoin boys" released after serving seven years in prison for the killing of a young girl in the Duquoin civil war of 1933, Mr. Edmundson said he would resign if it would bring peace between the rival unions. "I will step aside if the Progressive leaders agree to a convention," the U.M.W. leader told 800 miners attending

THE MEN WHO EDIT COAL AGE

SYDNEY A. HALE
Editor-in-Chief

WALTER M. DAKE
Managing Editor

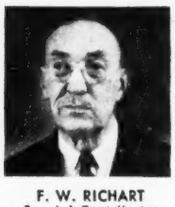
R. DAWSON HALL
Engineering Editor

J. H. EDWARDS
Associate Editor

IVAN A. GIVEN
Associate Editor

LOUIS C. McCARTHY
Assistant Editor

CHAS. H. LAMBUR, JR.
Assistant Editor



F. W. RICHART
Special Contributor

PAUL WOOTON, Chief of Staff, Wash. Bureau

95% Increase
IN ILLINOIS SUBSCRIBERS
Since December 1938

THANK YOU, ILLINOIS! . . . Month after month, for the past two years, COAL AGE has increased in circulation throughout the mining regions of Illinois, until today (December 1940) it shows a record-breaking total of over 900 paid subscribers! . . . Excellent testimony of how this ***leader*** in the coal mining field is referred to—and read—by those who wish to keep up-to-the-minute on the latest developments and achievements of this growing industry.

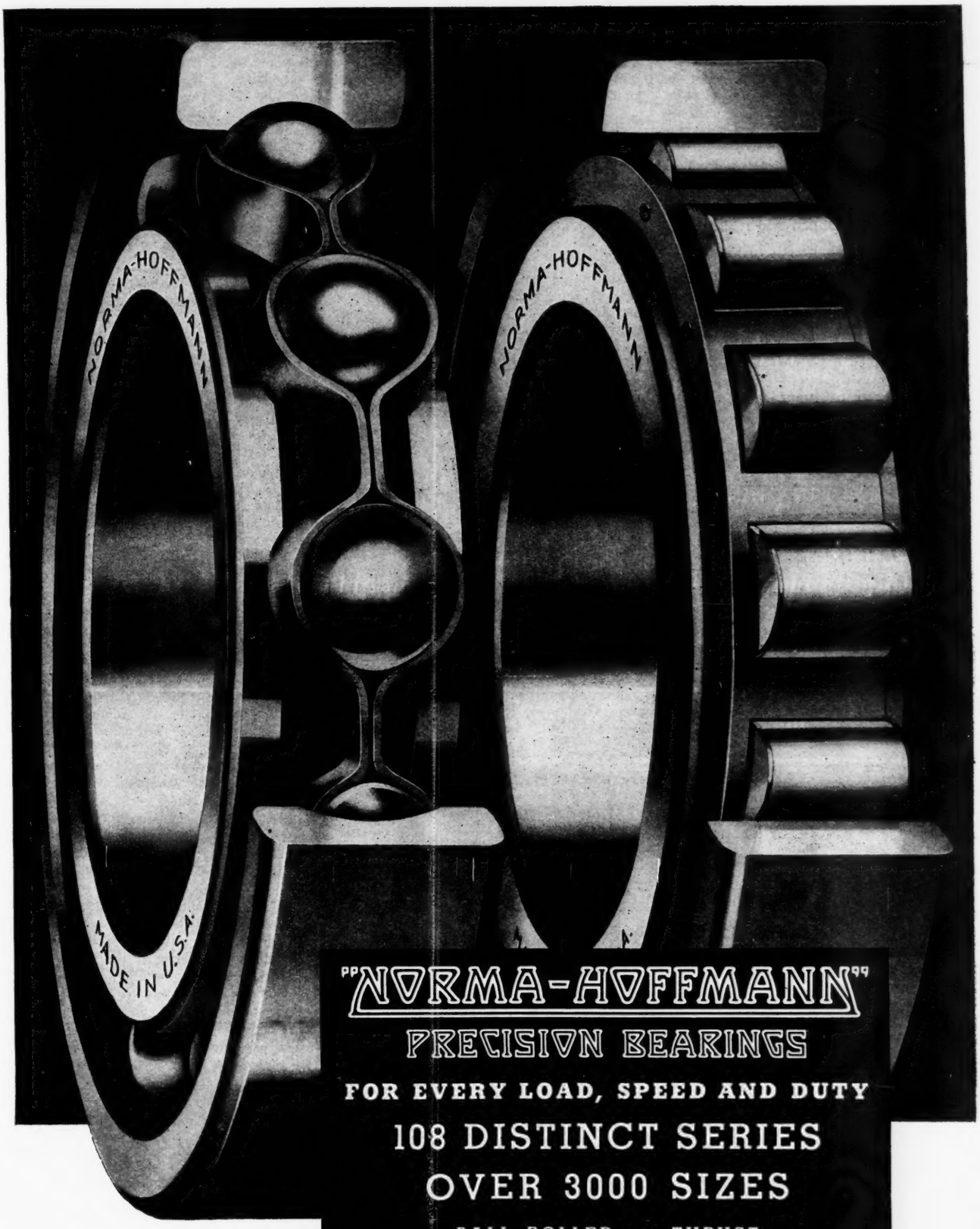
COAL AGE is delivered in this country, Canada, Mexico, Central or South America, for only $3.00 a year. 80% of COAL AGE's national audience (11,500 paid subscribers) request their copies sent to their homes, where leisure hours permit the careful study each month's contents warrant.

Why not have *your* personal copy of COAL AGE reach you the same way?

Write for the current month's issue if you haven't read COAL AGE lately. We'll gladly mail a complimentary copy so you can see what you're missing.

Coal Age

330 West 42nd Street, New York, N. Y.



"NORMA-HOFFMANN"

PRECISION BEARINGS

FOR EVERY LOAD, SPEED AND DUTY

108 DISTINCT SERIES

OVER 3000 SIZES

BALL, ROLLER AND THRUST

1/8" to 21" Bore—Metric and Inch Sizes

Write for the Catalog and Engineering Counsel

NORMA-HOFFMANN BEARINGS CORPORATION, STAMFORD, CONN., U.S.A.

the rally. "If you want Bill Keck for president, that's all right with me. I'll get out. I'll give all the help I can to Bill Keck."

Mr. Keck and other State officers of the Progressives declined to attend the meeting, charging that the rally was a scheme of the U.M.W. to trap Progressive officials into appearing to indorse a unity move.

•

Arkansas Preparation Plant Dedicated to St. Louis

The new $50,000 Excelsior Preparation Plant, Inc., at Hackett, Ark., having been completed, was dedicated to "St. Louis and its smoke elimination program" on Jan. 4. The plant was built to enable operators in the area to take advantage of the Frisco Railroad's $2 per ton trainload rate to St. Louis. Operators whose mines are not on the Frisco truck their coal to the plant to be prepared for shipment.

•

To Renovate 400 Beehive Ovens

H. C. Frick Coke Co. announced on Jan. 3 that it would begin at once to renovate 400 beehive coke ovens at its Collier plant, in the lower Connellsville (Pa.) district.

•

Fire Destroys Exeter Breaker

Fire of unknown origin completely destroyed the breaker at Exeter colliery, owned by the Lehigh Valley Coal Co. and leased by the Payne Coal Co., Pittston, Pa., on Dec. 25. The damage was estimated at $300,000. The company has resumed mining, shipping mine-run to a near-by breaker for preparation. Plans are under way for rebuilding.

•

Progressive Scale Convention To Start Feb. 17

Illinois Progressive Mine Workers will hold their biennial wage convention at Springfield on Feb. 17, it was announced at union headquarters in that city early in January. The task before the delegates will be to outline a new scale to replace the one that is to expire on March 31. The present pact, providing for a daily basic wage of $6 for seven hours, has been in effect since April 1, 1939. The new contract, to be made with the Illinois Coal Producers' Association, also will be for two years.

•

Pardees Sell Lattimer Holdings

Ownership of the Lattimer mines in Hazle Township, Pa., has been transferred from Pardee Brothers to Hydrotated Anthracite Fuels, Inc. The operations are among the oldest anthracite properties in Luzerne County.

•

Completing the Record

Cleaning equipment used in the Ol' Elliott preparation plant of the Moberly Fuel Co., Columbia, Mo., featured in the January *Coal Age*, p. 48, includes a Montgomery washer with a capacity of 40 tons of 3-in. x 0 coal per hour. This washer, supplied by the National Steel Washeries, Inc., was installed in 1939 and replaced the original Montgomery unit with a capacity of 20 tons per hour placed in service in 1938.

•

Sligo Tipple Destroyed

Fire of unknown origin destroyed a coal tipple owned by John C. Graham in Sligo Borough, Clarion County, Pa., on Dec. 25. Workmen began reconstruction the following week, with production of coal scheduled to be resumed the latter part of January.

•

Illinois Coking Plant Planned

Mulberry Hill Coal Co., Freeburg, Ill., plans the construction of a coking plant to cost $500,000. The scheme is to be financed through an increase in capital stock and a loan from the Reconstruction Finance Corporation. It is expected that St. Louis will furnish a market for most of the product.

•

Reorganization Plan Offered For Reading Coal & Iron

Nicholas G. Roosevelt, special examiner in reorganization proceedings of the Philadelphia & Reading Coal & Iron Co., reported to the U. S. District Court in Philadelphia, Pa., on Dec. 28 that the company was insolvent but could be reorganized. He recommended that, as the record offered no basis for estimating future earnings, the reorganization plan should provide a minimum of fixed charges, perhaps in the form of periodic payments to creditors on the basis of coal produced, gross revenues or some other basis; that the stock of the company be declared of no value, and that the plan take into account the relative interests of the secured and unsecured creditors in the securities issued by the reorganized company on a basis which takes into account the elements of value of the pledged and unpledged assets. Creditors, stockholders and other parties of interest were invited to submit suggestions or other plans to the court not later than Feb. 15.

The examiner recommended that liquidation should not be considered, as the population of the territory in which the company operates is almost entirely dependent on the company's continued operation and as it is almost impossible to set anything like a fair estimate on liquidating value.

Aims to Protect Investors

"The danger to the creditors in continuing operations," said Mr. Roosevelt, "is that the cash gain from operations might be reinvested in uneconomic capital expenditures or lost by continuing operations in an unprofitable period. In order to protect the creditors against this danger and to assure them of some payment on account of their debt, it seems to the examiner to be highly desirable to make suitable provision for periodic payments to the creditors on the

"He was singin' 'Mother Machree,' and got a lump in his throat!"

Two Furnaces Burn Illinois Coal Without Smoke

Southern Illinois Coals, Inc., comprising six producers, has opened an exhibit just outside the city limits of St. Louis to demonstrate that Illinois coal can be burned smokelessly. A garage is heated with two furnaces, one using the Piersed unit, which has an upper and lower grate. Raw coal is shoveled in between, and the device turned over, thus putting the fire on top of the raw coal to consume all volatile matter. The other unit has a Dewitt fire bowl, divided in half, and its volatile matter burns as it passes through the hot open half. When the furnace needs more fuel, the other half is filled and covered.

basis of coal produced, gross revenues, fixed minimum payments or some other standard.

"In addition to these payments the reorganized company could properly issue no-par-value stock to the creditors and such security holders as are entitled to participate in the organization. On such a basis the reorganization would take the form of a partial liquidation, and its operations would continue for only so long as minimum payments on the debt were made."

•

Albert B. Jessup Is Dead

Albert Beardsley Jessup, 67, prominent in the anthracite industry for many years, died Jan. 25 at his home in Waverly, Pa., after a long illness. He was graduated from Lehigh University in 1896 with the degree of Bachelor of Science in Mining and Mining Engineering and for some time was associated with the Lehigh Valley Coal Co. In 1912 he became vice-president and general manager of the Jeddo-Highland Coal Co., continuing in that capacity until 1937, when he retired.

He was at one time president of the Anthracite Coal Operators' Association, composed of independents, and also served in an advisory capacity to anthracite companies in regard to leases and freight rates.

•

Canadian Miners Given Bonus; Nova Scotia Board to Act

A cost-of-living bonus of 18c. a day for the period from Jan. 1 to April 30 has been approved for employees in Alberta and British Columbia coal mines who are covered by agreement between the operators and the United Mine Workers, it was announced Jan. 18 in Ottawa. The government approved the report of the Britnell commission set up to investigate the increased cost of

Offers Higher Capacity and makes a Lower Ash Coal . . . .

Improved "fanning out" action of the Diagonal Deck —the new record making Concenco Anti-Friction Head Motion—smooth and easy running—account for unsurpassed cleaning at surprisingly higher capacities.

Write for Bulletin No. 119

THE DEISTER CONCENTRATOR COMPANY

The Original Deister Co., Incorporated 1906

909 Glasgow Ave. Ft. Wayne, Ind., U. S. A.

BITUMINOUS CASUALTY CORPORATION
ROCK ISLAND ILLINOIS

Your

Workmen's Compensation

COSTS

can be controlled!

Frequent and severe accidents always lead to higher insurance costs, and disrupt vital schedules of production.

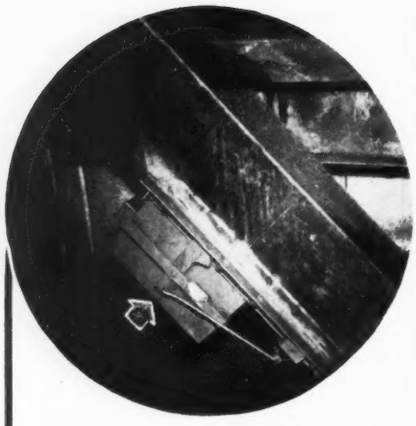
Only a well planned safety program can reduce your accident frequency and KEEP IT DOWN!

Bituminous Casualty mine safety engineers are qualified and ready to aid you. Every policy assures this FREE service and complete protection under the workmen's compensation law of your state.

Unusual safety problems are our specialty.

Let us help you control your insurance costs. Write today!

BC
SECURITY SERVICE



McLAREN COAL COMPANY STOPS THE IRON HERE WITH A DINGS CHUTE TYPE SEPARATOR

THE illustration shows the Dings *High Intensity* Chute Type Magnet installed in preparation plant of McLaren Coal Company's mine at Carterville, Illinois.

This inexpensive powerful automatic Magnet makes it possible for McLaren to ship stoker coal iron-free from the mine—a potent sales-getting factor in modern coal merchandising.

You can do the same—the positive, economical way—with Dings *High Intensity* Magnetic Separators. There's a size and type for every need—Magnetic Drums, Spout Magnets, Suspended Magnets, Magnetic Pulleys,—for use with chutes, belt conveyors, loading booms, etc.

Will you take the additional sales that come with coal that's *really* iron-free? Write to Dings today!

DINGS MAGNETIC SEPARATOR CO.
535 Smith St.
Milwaukee • Wisconsin
SEPARATION HEADQUARTERS SINCE 1899

Dings MAGNETIC SEPARATION HIGH INTENSITY

living in those areas since the last increase for the miners, March 31, 1938.

Negotiations for a new wage contract between the Dominion Coal Co. and its approximately 12,000 miners in Nova Scotia have reached a deadlock, according to D. W. Morrison, president of District 26, United Mine Workers. All the issues under consideration will be referred to the Federal Conciliation Board which inquired into wage differences last year before the signing of the present agreement, said Mr. Morrison. The board is headed by Justice C. P. McTague of the Ontario Supreme Court.

o

Calls St. Lawrence Project "Tragic Blunder"

Characterizing the St. Lawrence hydroelectric project as unduly costly, slow of realization—in fact, a tragic blunder—John D. Battle, executive secretary of the National Coal Association, unloosed the following blast against the scheme on Jan. 7:

"Congress will not have far to seek for complete proof that the St. Lawrence hydroelectric facilities, upon which the President is so insistent, will cost twice as much and take three times as long to get ready as coal-burning electric-generating plants of equivalent capacity. The immense steam plant for national defense now being built by the T.V.A. affords a striking object lesson, and, since it is a government enterprise, it is a yardstick that the administration cannot disavow.

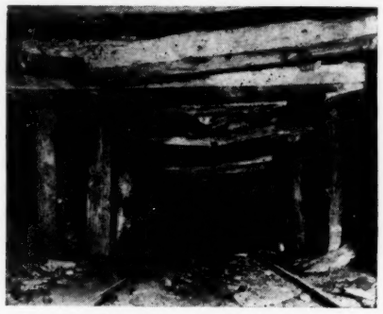
"The T.V.A. steam plant, started last August, will be finished and in operation next December or sooner—total elapsed time, sixteen months or less. It will have cost $10,000,000 and have a capacity of 120,000 kw.

"The time to complete and the over-all cost of the St. Lawrence hydro project are debatable questions, but at the speediest it will be three or four years before any electric power becomes available and, obviously, it will be much longer than that before the seaway becomes a reality. As for the cash, one point is clear—namely, that the New York Power Authority, a State agency borrowing the funds on the State's credit, is to be called upon to chip in $90,000,000 as its share in the enterprise, and is promised hydro-electric generating facilities stated to be 1,100,000 hp. capacity.

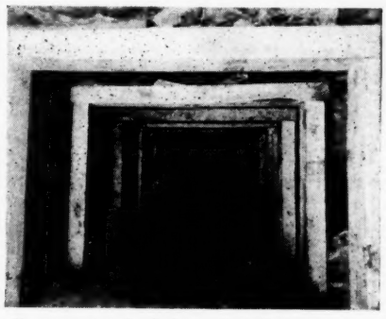
"Congress and the citizens of the State of New York have the right to assume that the New York Power Authority, if so minded, could build coal-burning steam plants for the generation of electric power in the State of New York just as expeditiously and just as economically as the T.V.A. is now doing in the State of Tennessee. If that be true, then it follows as a matter of elementary arithmetic that the New York Power Authority could build a series of strategically located steam plants with a total installed capacity equal to the 1,100,000 hp. of St. Lawrence hydro power for $68,000,000 as compared with $90,000,000 outlay budgeted as one (and only one) of the items in the half billion dollar St. Lawrence scheme.

"Aside from this initial savings of more than $20,000,000 in capital investment, a saving which would accrue to the taxpayers or the electric power consumers, or both,

OSMOSE-TREATED TIES & TIMBERS Will Last At Least 3 to 5 Times Longer!



Untreated timbers failing in large Alabama coal mine after only 2 years' service



Osmose-treated timbers, installed by same operator will last many times longer

OSMOSE
NATURAL PRESSURE
TREATMENT
enables you to
OBTAIN PERMANENT WOOD STRUCTURES AT LOWEST COST!!

Whenever you want to extend the service life of ties—timber sets—car bottom—trestles—tipples, etc., it can be done at amazingly low cost by using Osmose-treated wood.

The Osmose Natural Pressure Treatment increases service life of wood at least three to five times; requires no heat or pressure treating equipment, yet secures deep and effective penetration of proved wood preservatives at a fraction of the cost of comparable treating methods. You can apply Osmosalts yourself or buy wood ready-treated. Write for literature.

OSMOSE WOOD PRESERVING CO.
General Offices, Buffalo, N. Y.
Branch Offices
Birmingham, Ala. — Denver, Colo.
Harlan, Ky. — Mt. Vernon, Ill.
J. P. Hamer Lumber Co., Kenova, W. Va.

in the State of New York, this new increment of electric power which the administration asserts is so needful for national defense would become available early in 1942 instead of late in 1944.

"In the light of these facts, the St. Lawrence project is indeed a false front and a tragic blunder."

•

1940-41 Coal-Coke Standards Issued by A.S.T.M.

Standards on coal and coke, 1940-41, a 135-page book issued by the American Society for Testing Materials, Philadelphia, combines in convenient form all of the A.S.T.M. tests, definitions and specifications for coal and coke. The volume is issued under the auspices of Committee D-5 on Coal and Coke.

Included in the book are sections on sampling—coal for analysis, coal classed according to ash content, and sampling and fineness tests for powdered coal; then two grindability tests and other procedures for drop shatter, tumbler test, designating the size of coal from its screen analysis, test for size (anthracite), sieve analysis (crushed bituminous), cubic-foot weight (crushed bituminous), and a proposed test for agglutinating value of coal. Specifications for coals by rank and by grade also are included.

There are two methods covering coke for analysis, and volume of cell space of lump coke. Following these are specifications for sieves for testing purposes (wire-cloth sieves, round-hole, and square-hole screens or sieves) and foundry coke. Definitions of terms relating to coal and coke and gross and net calorific value of fuels, and commercial varieties of bituminous and sub-bituminous coals are covered. Copies of the book, at $1.25 each, are obtainable from the A.S.T.M. headquarters, 260 South Broad St., Philadelphia, Pa.

•

New Structure to Replace Harry E Breaker

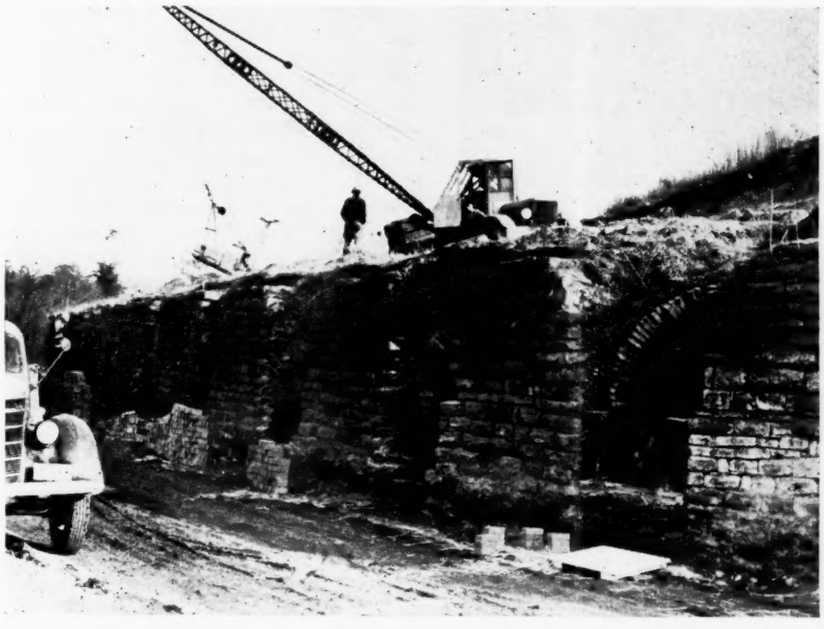
A modern new breaker of wood and steel construction, capable of handling 3,000 tons of coal a day, is to replace the old Harry E structure, Swoyersville, Pa., according to Louis Pagnotti, independent operator. A large force of men already is at work tearing down the old plant, and the company's product is being sent by rail to the Sullivan Trail breaker, at West Pittston, where it is being prepared for market.

•

To Refire 60 Coke Ovens

The DeBardeleben Coal Corporation has obtained an option on the 60 byproduct coke ovens formerly owned by the Central Iron & Coal Co. at Holt, Ala., which were recently purchased by the Associated Metals & Minerals Co. along with other property of the company at foreclosure sale. The DeBardeleben company expects to rehabilitate the plant, which has not been in operation for about eight years, and place it in operation in three or four months. The Warrior River Coke Co., wholly owned subsidiary of the DeBardeleben corporation, will be the operating agency.

The plant is located on the Warrior River and therefore is accessible to water transportation from mines of the parent company in Walker County. Ammonia, coal tar, oils and gas byproducts will be utilized from



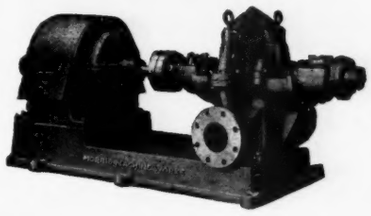
Alabama Beehive Ovens Being Restored to Service

Because of a pressing shortage of foundry coke in the Birmingham (Ala.) district, long unused beehive coke ovens are being restored to service. Above is shown part of a battery of 418 beehive ovens at Lewisburg, Ala., being reconditioned by the Sloss-Sheffield Steel & Iron Co. Ninety of the ovens, abandoned in 1920, are to be put back into service at a cost of $30,000. B. B. Walker, who was in charge of operations when the ovens closed down in January, 1920—for good, as he thought—is foreman of the crew restoring the ovens to use.

The MORRIS HYDRAULIC COLUMN

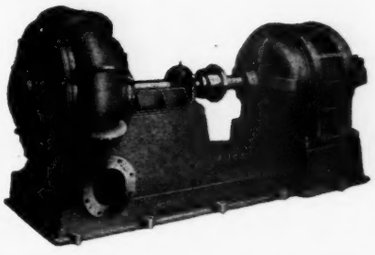
News of interest to Centrifugal Pump Users

PUMPS that quickly repay their cost



Through higher efficiencies

It isn't so long ago that 75% was considered a high efficiency for a clear water centrifugal pump. However, today, the remarkably high efficiencies of Morris Pumps will save 10% or more of the power required by older pumps. Figure for yourself what this would mean to you—and then investigate Morris Pumps.



Through lower maintenance

When pumps are to handle abrasive materials, simple design, long wearing metals, and provision for economical replacement are essential. Operating records prove that Morris abrasive-handling pumps have these characteristics.

Through greater capacity

For mine drainage condenser circulation, and other large-capacity services, Morris offers designs that have proven their thorough dependability and trouble free operation that assure low maintenance expense. Built for all capacities and heads.

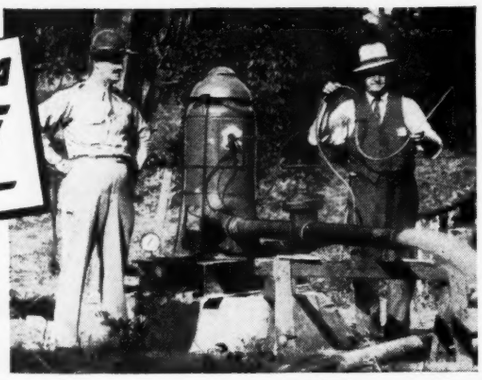
Write for descriptive bulletins

MEMBER

For authoritative recommendations on any pumping problem, write to Morris Machine Works, Baldwinsville, N. Y. Representatives in principal localities. *Export Office*, 50 Church St., New York.

★ For Defense!

FORTS, TOO, NEED A TROUBLE-FREE WATER SUPPLY—



YOU, who have already chosen Sterling Deep Well Pumps, will be happy to see this photograph of the first of four Sterlings being tested prior to permanent installation at Fort Benjamin Harrison.

YOU, who use Sterling Pumps, know that Sterlings destined for the U. S. Army passed the rigorous tests with "flying colors."

You will also be pleased to know that while Sterling Deep Well Pumps are being supplied for use by the Army, recent expansion plans have been completed that enable Sterling to take care of normal orders for pumps and service from private industry.

If you have water handling problems—write us today.

STERLING PUMP CORPORATION

Hamilton, O. **Stockton, Calif.**

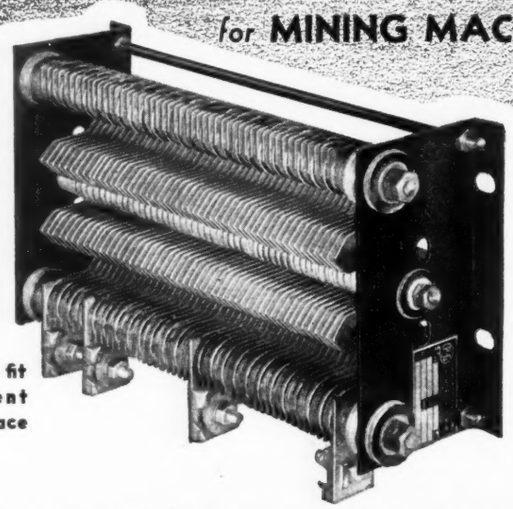
Representatives

EVANSVILLE, IND. Shouse Machinery Co.
PITTSBURGH, PA. Bushnell Machinery Co.
HUNTINGTON, W. VA. C. Ney Smith
KNOXVILLE, TENN. Tennessee Mine & Supply Co.
SCRANTON, PA. Scranton Electric Construction Co.
DENVER, COLO. Thompson Manufacturing Co.

P-G Steel Grid Resistors

By years of effective, trouble-free service, definitely prove their value...

for MINING MACHINES



Designed to fit your present resistor space

Built entirely of steel and high-grade mica—Nothing to crack, chip or break—Not affected by moisture, vibration or corrosive fumes—Adequate in-built capacity to handle an occasional overload—Try them on your Mining Machines——NOW.

THE POST-GLOVER ELECTRIC CO.

ESTABLISHED 1891

221 WEST THIRD STREET, CINCINNATI, OHIO

the coking operations, which will consume several hundred thousand tons of coal annually and give employment to about 600 men. There is an acute shortage of coke in the Birmingham district at present.

•

Oxyacetylene Welding Course Issued by Airco

A comprehensive course of exercises covering the oxyacetylene welding process for the aviation industry has been published by Air Reduction, New York City. The purpose of the course is to provide a well-planned series of exercises (67) to illustrate all the varied conditions existing in the art of aircraft welding. It can be utilized also to train operators who have had previous experience in other lines of oxyacetylene welding. The book, which sells for 50¢. per copy, may be obtained from Air Reduction Sales Co., New York City.

•

Obituary

CHARLES E. H. BROWN, 74, president and sales manager of the Masteller Coal Co., Keyser, W. Va., died Jan. 9 at his home in Waynesboro, Pa. He was identified with a number of other industrial ventures.

DR. JOSEPH A. WOOD, 83, president of the Amigo Coal Co., Amigo, W. Va., and a prominent Kanawha County physician, died Jan. 9. He was a former mayor of Pratt, W. Va., where he resided, and at various times was associated with several large coal companies.

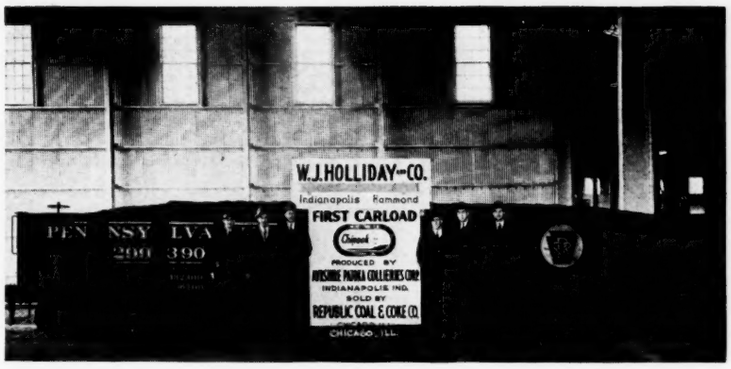
NICHOLAS CHRISTENSEN, 59, sales manager of the mining division of the Cardox Corporation, Chicago, and widely known in the coal-mining field, died Dec. 26 at Rochester, Minn. Born in Rebe, Denmark, he came to this country at an early age, and his long career in the sales field included the handling of a diversity of products ranging from baking powder to aircraft.

GEORGE T. SMITH, 85, president, Joseph Dixon Crucible Co., Jersey City, N. J., since 1908, died Dec. 20 in that city after a brief illness. His career, extending over 68 years, led him into railroading, government and banking.

FRED A. JORDAN, 68, assistant to the president, Youngstown Sheet & Tube Co., died at his home in Youngstown, Ohio, Dec. 14, from a heart attack. A graduate of Michigan College of Mining and Technology, he was an instructor there for a while, subsequently was employed by Witherbee, Sherman & Co., Port Henry, N. Y., and joined the Youngstown Sheet & Tube Co. staff in 1926. He acted as liaison officer between the president's office and the mines.

GEORGE MURRY BROOKS, 73, general counsel and vice-president of the Okonite Co., died Jan. 1 at the Columbia-Presbyterian Medical Center, New York City, after several weeks' illness.

C. C. MASH, resident engineer at the Brookside-Pratt Mining Co.'s Warrior River mine, Carbon Hill, Ala., was killed in an automobile accident Jan. 4.



Reception committee meets first car of coal from new mine.

Left to right—Frank Moorman, manager, Republic Coal & Coke Co., Indianapolis; G. Don Sullivan, assistant to the president, Ayrshire Patoka Collieries Corporation; Henry Cawthra, manager, W. J. Holliday & Co., Indianapolis; J. B. F. Melville, general manager, Ayrshire Patoka Collieries Corporation; J. W. McDivitt, preparation manager, Ayrshire Patoka Collieries Corporation, and W. P. Hammond, division freight agent, Pennsylvania R.R., Indianapolis.

First Car of Chinook Coal Shipped to Indianapolis

The first carload of commercial coal from the new Third Vein (Indiana) "Chinook" mine of the Ayrshire Patoka Collieries Corporation was received by W. J. Holliday & Co., Indianapolis, on Jan. 15. It was met by a reception committee consisting of officials of the producing company, representatives of the Holliday concern and of the Republic Coal & Coke Co., exclusive sales agent for the new product.

The Chinook operation, which is expected to produce more than 500,000 tons a year, is near Staunton, Ind., and is served by the Pennsylvania R. R. With the opening of this plant the Ayrshire Patoka Collieries Corporation has five operations, all in Indiana. Robert P. Koenig is president of the organization.

Coal from the new mine will be a washed product, prepared in a completely new, modern and up-to-date McNally-Pittsburg plant with a capacity of 400 tons per hour. The washing plant includes three wash boxes, and a completely equipped new laboratory will be maintained wherein quality of the coal will be controlled by periodic tests and analyses.

•

Pennsylvania Companies Merged

The Greensburg-Connellsville Coal & Coke Co., operating the Francis mine, Burgettstown, Pa., and the Tube City Collieries, Inc., operating the Hubbard mine, McKeesport, Pa., have been merged under the name of the former. The Baton Coal Co., Pittsburgh, Pa., will continue to act as sales agent for the new company.

•

Industrial Notes

GREEN FUEL ECONOMIZER CO., INC., has removed its New York City office to 185 Broadway.

CATERPILLAR TRACTOR CO., Peoria, Ill., has promoted L. C. Allenbrand to the position of manager of its sales development division. He succeeds C. E. Spain, who has been advanced to general sales manager.

IRON & STEEL PRODUCTS, INC., Chicago, has discontinued its St. Louis branch and will handle that territory direct from the main office.

CATERPILLAR TRACTOR CO., Peoria, Ill., has advanced George Rinck from assistant eastern sales manager to eastern sales manager. He succeeds Henry M. Hale, who has entered into partnership with John R. Taylor to form the Taylor-Hale Machinery Co. at Memphis, Tenn. The latter company will handle Caterpillar sales and service in an

COFFING RATCHET LEVER HOISTS | ADVANCED DESIGN SPUR GEAR HOISTS | HOISTS ELECTRIC HOISTS

RATCHET LEVER HOISTS

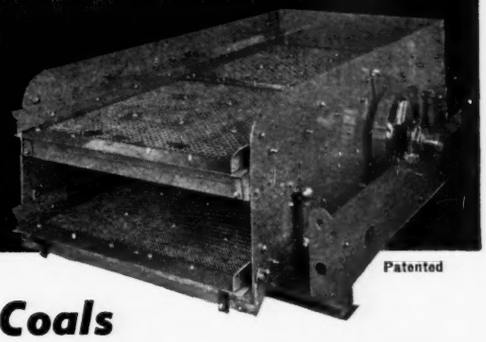
can save time and money on these jobs . . .

- pulling overhead trolley cables
- maintenance of dump cars
- tightening conveyor belts and chains
- skidding and installing heavy machinery
- changing screens
- changing cables on cages
- electric shovel maintenance
- raising and lowering equipment to and from deck
- changing spiders
- repairing truck frames
- straightening shafts
- lifting batteries to shuttle cars

The original ratchet lever hoist with the unusual safety feature of dual ratchet and pawl assembly with load always under control. Standard equipment at many large mines for all types of maintenance work. Operates in any position—cap. from ¾ ton—14 lbs. to 15 ton—150 lbs. Sold thru Mill Supply Houses all over the country. Send for catalog CG-4.

COFFING HOIST CO. DANVILLE ILLINOIS

SECO VIBRATING SCREENS



Patented

Will Size Stoker Coals

WITHOUT "BLINDING"

SINGLE AND MULTIPLE DECKS

The sharp action of the vibrating body of a SECO screen is not dampened by resilient mountings. The patented equalizer assembly, connecting body to base frame, fully controls the circle throw motion.

To this positive action has now been added a feature, also patented, that is unique in its ability to keep finer meshes from blinding.

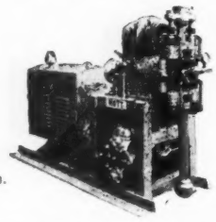
WRITE for the fully descriptive 46 page catalog.

SCREEN EQUIPMENT CO., INC.
9 Lafayette Avenue BUFFALO, N. Y.

DIAMOND CORE DRILLING

CONTRACTORS

Testing Coal Properties A Specialty



Guaranteeing Proper & Satisfactory Coal Cores. Large Dia. Holes drilled inside mines for all purposes. Deepwell drilling.

MOTT CORE DRILLING CO.

Huntington, W. Va.

FOR SAFETY'S SAKE, SUPERIOR COUPLINGS

Drop Forged Links

Drop forged for strength, Superior Swivel and Single Link Couplings are built to stand the gaff. No welds to let go with resulting wrecks. Superior Couplings on your mine cars will prevent accidents and reduce haulage costs. Order Superior Couplings for your replacements and specify them on new equipment.

DROP FORGED SWIVEL COUPLINGS

PITTSBURGH

KNIFE & FORGE CO.

Park Building
PITTSBURGH, PENNSYLVANIA

extensive southern area. Kenneth ("Hy") Cox will be the new assistant eastern sales manager for Caterpillar.

WRIGHT MFG. DIVISION of American Chain & Cable Co., Inc., York, Pa., has appointed George B. Kutz as southeastern district sales manager, probably with headquarters in Atlanta, Ga. He has been with the company for many years.

OHIO BRASS CO., Mansfield, Ohio, announces the appointment of J. H. Sanford as manager of its mining division. He assumes the duties of the late John C. Wilson. Assisting Mr. Sanford will be Floyd F. Smith, formerly engineering secretary of the company; his title will be assistant manager. Both Mr. Sanford and Mr. Smith are well known in the mining industry, having spent considerable time in the field on sales and engineering trips.

FALK CORPORATION, Milwaukee, Wis., has promoted Harold F. Falk to general superintendent. Since his graduation from the School of Engineering at the University of Wisconsin he has been successively superintendent of the welding department, then in charge of shop production and schedules, then production manager.

GENERAL ELECTRIC CO. announces these appointments: J. J. Curtin, who for the last eleven years has been in charge of sales promotion and publicity work in the motor division of the industrial department, has been transferred to the wire and cable division of the central station department at Fort Wayne, Ind. He replaces B. F. Ilsley, who has been moved to Schenectady, N. Y., to be general assistant to W. V. O'Brien, division manager of wire and cable. O. F. Vea has taken over the work formerly handled by Mr. Curtin. P. A. McTerney has been appointed manager of sales, large motor and generator division of the industrial department. An apparatus sales section has been added to the industrial department, under supervision of G. L. Irvine, who has been appointed manager of apparatus agency sales. G. E. Cassidy has been appointed engineer of the general applications section, a new division of the industrial engineering department. J. S. Overstreet has been placed in charge of wire and cable sales, wire and cable division, Schenectady.

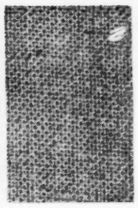
OKONITE CO., manufacturer of insulated wires, cables and splicing tapes, has opened a district sales office at 1212 Comer Building, Birmingham, Ala. The manager of the new office is Dewey A. White, formerly sales engineer in the company's Atlanta office. The new branch will serve the States of Tennessee, Alabama, Mississippi and Louisiana. The company's St. Louis office has been moved to 1406 Shell Building, with Robert E. Sontag remaining in charge.

TIMKEN ROLLER BEARING CO. has made M. C. Bellamy district manager of industrial bearing and steel sales for the Seattle (Wash.) territory. After his graduation from Purdue University he spent several years in other industrial capacities before joining Timken in 1928. He was appointed sales engineer in 1930.

WORTHINGTON PUMP & MACHINERY CORPORATION, Harrison, N. J., has engaged M. P.

Moropa

. . . THE BRATTICE CLOTH THAT RESISTS . . .



- *Flame*
- *Rot*
- *Air Loss*
- *Fungus*
- *Mildew*
- *Abrasion*

• Prevent loss of life, property and curtailment of profitable operation with a brattice cloth you know you can depend on—MOROPA. Its ability to resist flame, rot, fungus, air loss and mildew has been proved in field and laboratory tests . . . also, that MOROPA outlasts ordinary brattice cloth *2 to 4 times* under severe conditions. MOROPA is made in one grade and one quality —standard widths are 36", 48", 60", 72" and 84". A sufficient stock to fill your needs is always available. Write for complete data on standard sizes or special sizes for your special needs.

JOHN FLOCKER & CO.
ESTABLISHED 1822
642 Grant St. Pittsburgh, Pa.

TIME TO PREPARE

for preparing

PREMIUM Stoker Coal

Erecting a "Pennsylvania" BRADMILL for preparing PREMIUM Stoker coal.

Tests made in 3 different types, leading to selection of equipment for preparing 1¼"x⅛" Domestic Stoker coal, indicated approx. 22%, and 16% minus ⅛" from two types, with varying amounts of oversize, while the BRADMILL test showed less than 9% ⅛" and *no* oversize.

With more than $1.00 differential between Stoker coal, and the ⅛" fines, savings show early amortization of the investment made in the BRADMILL.

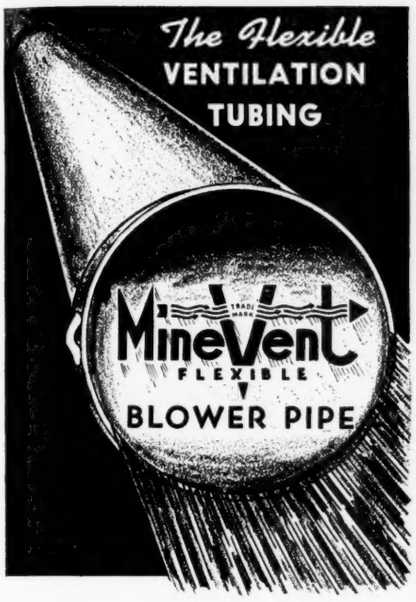
On receipt of your Stoker Coal specifications, we will be glad to make recommendations and quotation on indicated equipment.

Ask for Bulletin 8001

PENNSYLVANIA CRUSHER COMPANY

Liberty Trust Bldg. Philadelphia

Representatives in principal centers



Low cost, practical, easily installed **METHOD** *for Auxiliary Ventilation*

4 TYPES: **No. 11** for development work and where light weight is desired. Rubber coated heavy cotton base.

No. 12 for frequent moving such as with conveyors. Water repellent, fungus- and acid-resisting — tightly woven cotton base.

No. 14 for ordinary mine conditions and continuous duty. Heavy rubber impregnated, tough jute base, especially resistant to fumes, acid, water, fungus.

No. 15 for extreme conditions found in deep mines. Recommended for long service. Resistant to fungus, acid, water, vitiated air, etc. Heavy duck base.

Independent Couplings

For highly flexible installation. Forms a strong, airtight joint. Permits easy, simple connections. Quickly demountable.

★ One man can install. Air losses prevented. Easy to carry. Can be rotated in patented coupling to proper position or to relieve points of wear. Odd lengths can be utilized. Fool-proof. Tubing can be cut to length on the spot. Write for bulletin giving full details.

American **BRATTICE CLOTH CORPORATION**
WARSAW, INDIANA
Agencies in all Mining Centers

Robinson, proprietor of the Robinson Filter Co., to take charge of its newly organized water-purification-equipment division. Prior to establishing his own company in 1937 Mr. Robinson had been for 17 years eastern representative of the International Filter Co., Chicago.

MANNING, MAXWELL & MOORE, INC., Bridgeport, Conn., manufacturer of pressure gages, safety valves, thermometers and globe valves, has appointed Clinton D. St. Clair as works manager of its Hancock valve division plant in Boston. Since his graduation from Purdue University he has been associated with B. F. Goodrich, Ohio Match Co., Erie City Iron Works and American Machine & Metals, Inc.

•

Bradford Commissary Burns

The commissary of the Bradford mine of the Alabama By-Products Corporation, Dixiana, Ala., was destroyed by fire Dec. 28 with an estimated loss of $20,000. The fire is believed to have originated in the basement of the structure.

•

Continental Properties on Sale

Pursuant to the order of a referee in bankruptcy, assets of the Continental Coal Co., including real estate, leases, contracts, mining rights, etc., in Marion and Monongalia counties, West Virginia, were to be disposed of at public sale Jan. 31 at the Marion County Courthouse, Fairmont, W. Va. Three mines are involved, two of which have been inactive for some time.

•

Morgan Co. Signs With Union

F. C. Morgan Coal Co., which operates a stripping plant near White Plains, Ky., has signed a closed-shop contract with the United Mine Workers, according to an announcement on Jan. 9 by E. J. Morgan, Madisonville, Ky., president, District 23, U.M.W. The company employs 35 men.

•

Rewards Offered Safe Workers

Monthly rewards for safe workers in 1941 are offered by the Hudson Coal Co., Scranton, Pa., as follows: a $30 suit of clothes, three cash prizes of $5 each, and novelty prizes. There will be drawings for these prizes, those eligible for the first prize including all employees working in a mine foreman's territory which has been free of lost-time accidents in the previous calendar month. For the cash prizes, all employees of those sectional foremen, outside foremen, maintenance foremen and power-plant engineers whose territories have been free of lost-time injuries in the previous month are eligible. All employees in attendance at the safety meeting at the time of the drawing may participate in the drawing for novelty prizes—but supervisory officials or office employees are not eligible to participate in any of the above drawings.

Drawing No. 4, however, carries a cash

YOU CAN ELIMINATE STOKER DAMAGE *by* **TRAMP IRON** *with*

Stearns **MAGNETIC PULLEYS**

Air cooled, because they are ventilated, and will provide a powerful, positive, automatic and economical means of diverting tramp iron from your product. Made in a wide variety of sizes to fit your conveying system or in self contained units, all sizes, for moving from place to place. Ask for Bulletin 301.

It may be that an automatic spout type magnet will better suit your needs. Being satisfactorily used in many outstanding coal conveying systems. Get our Bulletin 97-A.

Stearns Engineers are well qualified to advise you. Ask for our recommendations. No obligation.

STEARNS MAGNETIC MANUFACTURING CO.
661 S. 28th St., Milwaukee, Wis.

RAPID ACCURATE WEIGHT Protects Your Profits

HOWE
TIPPLE SCALES
RAILWAY TRACK SCALES
HOPPER SCALES
TRUCK SCALES
WEIGHTOGRAPHS
DIALS
Write for Information

Send today for Folder, "Howe Scales for Every Weighing Purpose."

THE HOWE SCALE CO.
107 Scale Avenue, Rutland, Vermont

PORTABLE'S CAP LAMP . .
Guaranteed to Make Good

Portable's 12-month cap lamp contract, under which Portable's Lamps are distributed, contains the most inclusive service clauses ever known to the industry. It *guarantees* that your cap lamp light volume will remain constant as long as you use Portable Lamps . . . that batteries will never drop to less than 80% of new efficiency . . . that you may reduce your lamp requirements at the end of any 12-months' period without penalties.

It will pay you to investigate Portable's Cap Lamp—so foolproof, so efficient that it allows us to make these guarantees. Write today for more information.

Portable Lamp & Equipment Co.
72 FIRST AVENUE PITTSBURGH, PA.

Cool Caps and Hats Electric Cap Lamps Safety Lamps
Safety Shoes Goggles Respirators

prize of $5, for which shall be eligible all sectional foremen, driver bosses, outside foremen, assistant outside foremen, breaker bosses, maintenance foremen and power plant engineers whose territories were free of lost-time injuries during the previous calendar month.

•

Plan Refuse-Disposal System

Contract has been let for construction of a new aerial tramway for disposal of refuse from Summerlee mine of the New River Co., Summerlee, W. Va. The new system, which is expected to take care of refuse from the mine for eleven years, will consist of 1⅛-in. steel cables extending 2,500 ft. from the tipple to the top of a hill beyond the mine. The bucket, having a capacity of 125 cu.ft., will be propelled 1,000 ft. per minute by a 75-hp. motor.

•

Coal-Mine Accident Fatality Rate Registers Upturn

Accidents at coal mines of the United States caused the deaths of 99 bituminous and 9 anthracite miners in November last, according to reports furnished the U. S. Bureau of Mines by State mine inspectors. With a production of 40,300,000 net tons, the accident death rate among bituminous miners was 2.46 per million tons, compared with 2.03 in November, 1939.

The anthracite fatality rate in November last was 2.33, based on an output of 3,869,000 tons, against 3.04 in the corresponding month a year previous.

For the two industries combined, the accident fatality rate in November last was 2.45, compared with 2.12 in the eleventh month of the preceding year.

Fatalities during November last, by causes and States, as well as comparable rates for the first eleven months of 1939 and 1940, are shown below.

•

Carswell Mine Explosion Kills 5, Injures 12

An explosion in the Carswell mine of the Koppers Coal Co., Welch, W. Va., on Jan. 22 resulted in the deaths of five miners and injuries to twelve others, two of whom may die. The blast, which occurred at 4:30 a.m., trapped the men, who were loading coal on conveyors on the night shift; two escaped with minor burns. About 300 others were not affected.

•

Trade Literature

BALL BEARINGS—Stephens-Adamson Mfg. Co., Aurora, Ill. Catalog 840 gives simplified presentation of Sealmaster units, describing applications and assembly, with engineering data.

CONTROLS—General Electric Co., Schenectady, N. Y., has issued these bulletins: GEA-2234C, Manual Motor-Starting Switch CR1061; GEA-3469, New Pushbutton Sta-

UNITED STATES COAL-MINE FATALITIES IN NOVEMBER 1940, BY CAUSES AND STATES

	Underground									Open-cut and Surface			
State	Falls of Roof	Falls of Face	Haulage	Gas or Dust Explosions	Explosives	Electricity	Machinery	Other Causes	Total Underground	Shaft	Falls of Persons	Other Causes	Total Surface	Grand Total
Alabama	..	..	1	..	..	..	..	..	1	..	..	..	..	1
Arkansas	1	..	..	..	..	..	..	..	1	..	..	..	..	1
Colorado	1	..	..	..	1	..	..	..	2	..	..	..	..	2
Illinois	5	3	3	..	..	..	..	1	12	..	1	..	1	14
Indiana	1	..	..	..	..	..	..	..	1	1	..	..	..	1
Iowa	..	..	..	..	..	..	..	..	..	..	..	..	..	1
Kentucky	13	..	1	..	..	1	..	..	15	1	..	..	..	15
Michigan	1	..	..	..	..	..	..	..	1	..	..	..	..	1
North Dakota	..	..	..	..	1	..	..	..	1	..	..	..	..	1
Ohio	3	..	..	31	..	..	..	..	34	1	..	..	..	35
Oklahoma	1	..	..	..	1	..	..	..	2	..	..	..	..	2
Pennsylvania (bit.)	4	1	2	..	..	..	..	..	7	..	..	..	..	7
Utah	..	..	1	..	..	..	..	..	1	..	..	..	..	1
Virginia	2	..	..	..	..	..	..	..	2	..	..	..	..	2
Washington	..	..	..	..	..	1	..	..	1	..	..	..	..	1
West Virginia	7	..	1	..	..	1	..	..	9	..	..	2	2	11
Wyoming	1	..	1	..	1	..	..	..	3	..	..	..	..	3
Total (bituminous)	40	4	10	31	4	3	...	1	93	3	1	2	3	99
Pennsylvania (anthracite)	3	1	1	1	..	1	1	..	8	..	..	1	1	9
Grand total	43	5	11	32	4	4	1	1	101	3	1	3	4	108

FATALITIES AND DEATH RATES AT UNITED STATES COAL MINES, BY CAUSES*

January-November, 1939 and 1940

	Bituminous				Anthracite				Total			
	Number Killed		Killed per Million Tons		Number Killed		Killed per Million Tons		Number Killed		Killed per Million Tons	
Cause	1939	1940	1939	1940	1939	1940	1939	1940	1939	1940	1939	1940
Underground:												
Falls of roof and coal	455	469	1.287	1.136	111	90	2.338	1.985	566	559	1.412	1.220
Haulage	137	169	.388	.409	25	34	.527	.750	162	203	.404	.443
Gas or dust explosions:												
Local	14	12	.040	.029	3	4	.063	.088	17	16	.042	.035
Major	28	267	.079	.646	...	...	.....	.....	28	267	.070	.583
Explosives	13	25	.037	.061	14	8	.295	.177	27	33	.067	.072
Electricity	44	30	.125	.073	2	6	.042	.132	46	36	.115	.078
Machinery	33	23	.093	.055	1	3	.021	.066	34	26	.085	.057
Shaft	5	8	.014	.019	6	3	.126	.066	11	11	.028	.023
Miscellaneous	19	25	.054	.061	13	6	.274	.132	32	31	.080	.068
Stripping or open-cut	8	11	.022	.027	7	3	.147	.066	15	14	.037	.031
Surface	34	39	.096	.094	13	6	.274	.132	47	45	.117	.098
Grand total	790	1,078	2.235	2.610	195	163	4.107	3.594	985	1,241	2.457	2.708

*All figures subject to revision.

tions; GEA-2599, "Why FH Cubicles?"

CONVEYOR BELTS—B. F. Goodrich Co., Akron, Ohio. Booklet shows construction details and varied types of operation of the company's cord unit, discussing physical advantages of its construction, increased cover adhesion, flexibility, mildew resistance, freedom from stretch, vulcanized and metal splices, and engineering advantages.

CULVERTS—Koppers Co. (Wood Preserving Division), Pittsburgh, Pa. Booklet Form G-16 describes prefabricated culverts made of laminated, pressure-creosoted wood with sections interlocking cornerwise and lengthwise to form a solid, unified construction. Drawings and halftones show how they are assembled.

HAND POWER UNITS—J. E. Shaffer Co., Tulsa, Okla. Folder describes design, materials and operation of "Come-Along" units having application for a variety of purposes.

HIGH-STRENGTH STEEL—Bethlehem Steel Co., Bethlehem, Pa. Catalog 156 cites advantages, distinctive features and uses of Mayari R steel as a modern, dependable and economical material with low-alloy, high-strength and corrosion-resisting qualities.

INSULATORS—Ohio Brass Co., Mansfield, Ohio. Catalog 24 lists all O.B. materials for transmission lines, distribution lines and substations, including standard and radio-proof pin-type insulators, strain insulators and fittings, insulated clevis assemblies; standard, high-impact and smogproof suspension insulators, suspension insulator fittings, other line hardware, pincap and post-type station insulators, oil-filled and dry-type apparatus bushings, entrance bushings and tubes, porcelain condensers, and control gaps. Tables of recommended strain and suspension clamps for all commonly used conductors are included.

MOTOR MAINTENANCE—General Electric Co., Schenectady, N. Y. Bulletin GEA-3488 gives basic rules and facts that a maintenance man must know, remember and organize into his work if he is to do an efficient job in assuring long life to motors and minimize production interruptions.

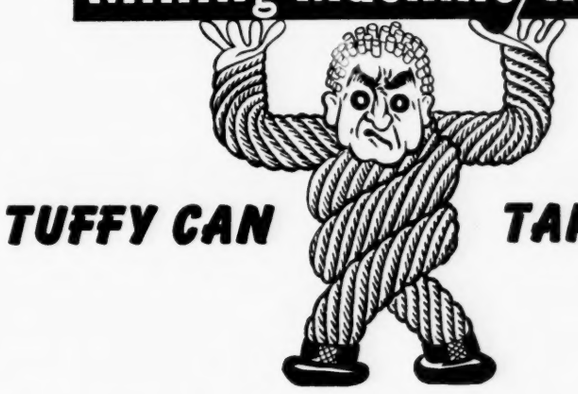
MUCKING SHOVELS—Goodman Mfg. Co., Chicago. Bulletin L-401 covers the company's line of Conway units, containing description, records and applications.

PAINTS—Paint Engineers, Inc., Hawthorne, N. J. Color and Standards Specification Book embodies engineering principles in relation to industrial and structural painting and paint maintenance.

PNEUMATIC TOOLS—Independent Pneumatic Tool Co., Chicago. Catalog 52 features eight new Thor tools; right-angle and close-corner drills, right-angle nut setters and screwdrivers, bolt wrenches, grinders, chipping hammers, sanders and saws. Specifications also are given on the entire line of Thor pneumatic tools and accessories.

PORTABLE CABLE—General Electric Co., Schenectady, N. Y. Bulletin GEA-1918B contains general description, applications,

Tuffy
Mining Machine Ropes



TUFFY CAN TAKE IT!

Regardless of load—of strain—TUFFY Can Take It. Scientifically designed, Tuffy Ropes help reduce mining accidents to a minimum—thus automatically reducing expenses and delays. Because they last longer, replacements are less frequent. It pays to save and be safe with Tuffy.

WRITE FOR INFORMATION

Makers of Wire Rope for All Purposes

UNION WIRE ROPE CORPORATION
GENERAL OFFICES AND FACTORY:
2130 Manchester Ave. Kansas City, Missouri
Tulsa • Houston • Chicago • Salt Lake City
New Orleans • Monahans • Portland • Ashland, Ky. T-1

UNION Wire Ropes
The "ULTIMATE LOW COST WIRE ROPE"

Rugged Sensitive Dependable

KOEHLER FLAME SAFETY LAMP

The Koehler Flame Safety Lamp has two features that insure protection in the mine.
FIRST—Better Ventilation.
SECOND—Greater GAUZE AREA, for increased sensitivity.
It is rugged, simple and dependable. Will withstand the most constant use and give the most satisfactory service at lowest operating and maintenance cost. The Koehler is as modern

KOEHLER SAFETY LAMP

WHEAT CAP LAMP

KOEHLER MFG. CO.
Marlboro . . . Mass.
Eastern Bituminous: WHEAT LAMP SALES, INC., 1501 Kanawha Valley Bldg., Charleston, W. Va.
RUGGED - DEPENDABLE SENSITIVE
TWINS OF MODERN MINING
BETTER LIGHT - LESS WEIGHT NON-SPILLABLE

PROFESSIONAL SERVICES

Consulting Engineering Examinations
Specialists Geologists Reports
Plant Design Operation Construction

ALLEN & GARCIA CO.
ENGINEERS AND BUILDERS OF MODERN COAL OPERATION
Authoriative Valuations and Reports of Mining Properties, Equipment and Operation.
332 S. Michigan Ave., Chicago
120 Wall Street, New York, N. Y.

C. C. MORFIT
Mining Engineer
Construction, Operation, Management Valuation
11 Broadway, New York

EDWARD V. D'INVILLIERS ENGINEERING CO.
GEOLOGIST AND MINING ENGINEERS
Specialist in examination and valuation of bituminous coal properties; investigations of operating conditions, costs and markets; development of mineral resources.
Private records covering 40 years of professional activity in coal fields of United States and Canada.
121 N. Broad St., Philadelphia, Pa.

Stuart, James & Cooke, Inc.
ENGINEERS
Coal plant design, construction, supervision and operation. Operating cost surveys and analyses. Power surveys and electrification. Examinations and valuation of coal properties.
17 Battery Place, New York

EAVENSON, ALFORD AND AUCHMUTY
MINING ENGINEERS
Coal Operation Consultants
Valuations
Koppers Bldg. Pittsburgh, Pa.

TEMPLETON-MATTHEWS CORPORATION
Designing Engineers—Consultants—Builders
"Practical Application of Skilled Engineering to your Coal Preparation Problems."
1003 Sycamore Bldg. Terre Haute, Indiana

J. H. FLETCHER
Consulting Engineer
Mining Reports, Appraisals and Power Surveys
Engineering Management of Coal Mines
Automotive Gathering System
Mine Layouts
Telephone—Harrison 5151
McCormack Building Chicago, Ill.

PAUL WEIR CLAYTON G. BALL
Mining Engineers and Geologists
Examinations and Reports
Production, Preparation and Utilization
307 North Michigan Ave., Chicago, Ill.

T. W. GUY
Consulting Engineer
COAL PREPARATION
To Yield Maximum Net Returns
Face and Product Studies
Plant Design and Operation
Coal Sampling
Kanawha V. Bldg., Charleston, W. Va.

READERS MAY CONTACT
the consultants whose cards appear on this page with the confidence justified by the offering of these special services nationally.

The Cincinnati
TRADE MARK
ONE MAN COAL DRILL
. . . lowers drilling costs because it is designed and constructed to give more power "pound for pound" and more drilling efficiency "day after day." Used successfully in drilling both anthracite and bituminous coal. Easy to operate, easy to handle. Sold with a money-back guarantee. Write today.
Write today for FREE illustrated bulletin
The Cincinnati Electrical Tool Co.
Division of The R. K. LeBlond Machine Tool Co.
2677 Madison Rd., CINCINNATI, OHIO

current-carrying capacities and physical data on tellurium portable cable for all portable electric machinery.

PORTABLE ELECTRIC TOOLS—Black & Decker Mfg. Co., Towson, Md. Catalog illustrates and describes the company's complete line of 132 portable electric tools including many new and improved items.

SHOVEL—Buckeye Traction Ditcher Co., Findlay, Ohio. Bulletin 16-10 covers the Model 70¾-yd. Buckeye Clipper convertible shovel, giving full specifications and illustrating the ease of convertibility to dragline, crane and trench hoe.

SURFACE EQUIPMENT—Robins Conveying Belt Co., Passaic, N. J. Bulletin 112 describes the Robins-Oro manganese steel apron feeder. Bulletin 104 covers Gyrex screens, Vibrex screens, belt conveyors, conveyor idlers, training idlers, mine conveyors, chain conveyors, bucket elevators, loading booms, picking tables, vibrating chutes, crushers, feeders, stackers, grab buckets, car dumpers, car retarders and car hauls.

TOOL STEEL—Jessop Steel Co., Washington, Pa. Folder describes Top Notch shock-resisting tool steel, giving complete information on its heat-treatment for makers and users of chisels and pneumatic tools as well as tools and dies for cold work or semi-hot-work application where resistance is severe and repeated impact is important.

TRANSFORMERS—Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Application Data 211 tells how to apply CSP power transformers, which are said to be completely self-protecting, completely self-contained substations for single feeder service, on industrial distribution systems. Economic advantages of the unit-substation transformers are explained.

TWO- AND THREE-STAGE COMPRESSORS—Worthington Pump & Machinery Corporation, Harrison, N. J. Bulletins L-611-B11A and L-611-B12B give descriptions, engineering data and detailed specifications on two- and three-stage units, respectively, steam- and motor-driven.

VALVE—B. F. Goodrich Co., Akron, Ohio. Catalog Section 9787 gives complete directions for installation and care as well as a detailed description of the services to which the Vulcalock valve may be put.

VARIABLE SPEED CONTROL—Reeves Pulley Co., Columbus, Ind. Booklet Form G-412 tells how to speed up production with variable speed control, citing 36 specific examples in all types of industrial plants in which speed control made possible definite production increases and advantages.

•

Out of Order

In some inexplicable manner—characteristic of a publishing or printing plant—pages 108 and 110 of our January issue became transposed—that is reversed—108 should have been 110 and vice versa. We regret any mystification caused our readers.